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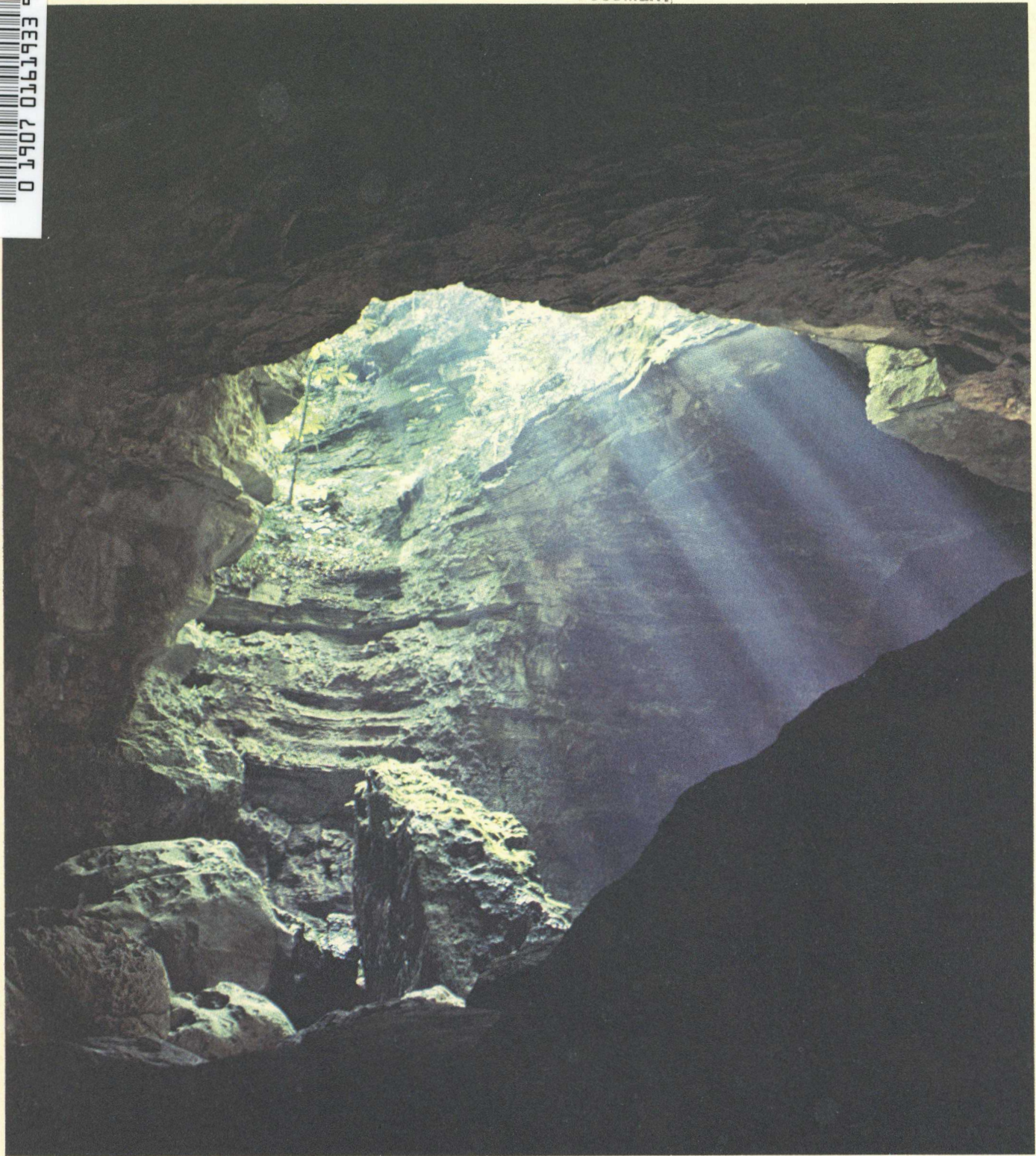
Invertebrate Fauna from Missouri Caves and Springs

APR 29 1986 283

James E. Gardner

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Cover: Rays of sunlight penetrate the deep sinkhole entrance to Jam Up Cave, one of three entrances representing a classical example of Missouri karst phenomena. A state designated natural area, the cave and Jacks Fork River bluff are one of Missouri's most unusual and botanically mysterious areas. Photo by David L. Tylka.



Invertebrate Fauna from Missouri Caves and Springs

James E. Gardner

Missouri Department of Conservation

**Natural History
Series No. 3**

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Medlock Cave in March

James E. Gardner

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Foreword

INFORMATION ON CAVE organisms occurring in public caves in Missouri has not been previously collected or compiled in a way to help management of these significant underground resources. Recognizing this need, a cooperative cave inventory project was spearheaded in 1978 by the Missouri Department of Conservation, the Mark Twain National Forest, and the North Central Forest Experiment Station-Columbia, Missouri (U.S. Forest Service). The purpose of this study was not only to inventory cave fauna, but to evaluate other significant resources of caves, and to identify more hazardous situations in caves.

In 1980, the Missouri Department of Natural Resources joined in this cooperative effort, and caves in

Missouri's State Parks were inventoried and evaluated. An additional project, in cooperation with the Ozark National Scenic Riverways (National Park Service), began in 1982 and was amended in 1983. The results of the biological study conducted in these state and federal agencies' caves are presented in this work, in an effort to promote the study and conservation of Missouri's cave fauna resources.

While many individuals cooperated and assisted in this project, field inventories were primarily carried out by James E. Gardner, wildlife biologist, Missouri Department of Conservation, between September, 1978 and August, 1984.

Abstract

A BIOLOGICAL INVENTORY of 436 caves and 10 springs, found in 38 counties in Missouri, was conducted from September, 1978 through August, 1984. Records presented in this study were based on collections of more than 4,500 invertebrate specimens, combined with taxonomic determinations and contributions from some 60 invertebrate systematists. Some 414 invertebrate species have been identified as a result of these collections. Data provided for each species include systematics, occurrence and natural history notes. Known geographic distribution and records from previously published materials are included for most species.

The total invertebrate fauna include a horsehair worm, two flatworms, three leeches, 30 snails, 19 isopods (11 aquatic and eight terrestrial), 16 amphipods, nine crayfish, eight pseudoscorpions, five ticks, 11 harvestmen, 36 spiders, 18 centipedes, a symphylan, 18 millipedes, 42

springtails, five diplurans, three mayflies, a dragonfly, six crickets, 112 beetles, a psocid, eight hemipterans, a homopter, two dobsonflies, 11 caddisflies, two stoneflies, nine moths, 25 flies, three fleas and five hymenopterans.

Each species was classified according to its probable ecological role in the subterranean environment (troglobite, troglophile, troglaxene or accidental). Thirty-nine invertebrate taxa were categorized as troglobitic, including a flatworm, two snails, nine aquatic isopods, one terrestrial isopod, nine amphipods, two crayfish, a pseudoscorpion, a spider, a symphylan, four millipedes, five springtails, and three diplurans.

At least 26 invertebrate taxa represent previously undescribed species. Thirteen of these undescribed taxa were categorized as troglobites, including three aquatic isopods, a terrestrial isopod, four amphipods, two springtails and three diplurans.

Introduction

INTEREST IN MISSOURI'S subterranean fauna began over a century ago when Ruth Hoppin collected animals from caves in southwestern Missouri. Two Harvard professors, Samuel Garman and Walter Faxon (1889), studied and identified her collections and published one of the earliest known accounts of Missouri's cave fauna. Studies of particular interest soon began, such as Crosby (1905), spiders of Rocheport Cave. Many new cave animals were subsequently studied and described from the cavernous areas of Missouri (Creaser, 1931; Eigenmann, 1898; Hubbell, 1936; Hubricht and Mackin, 1940; Hyman, 1937, 1956; Loomis, 1939, 1943).

Studies of cavernicolous fauna in Missouri stagnated during the early 1900s, but were reactivated in the 1930s. The mass of data collected by nonprofessional biospeleologists, cave explorers and surveyors stimulated continued work. Some data was gathered by early Missouri biospeleologists and by scientists traveling through Missouri. Such random studies were widespread, but they were still primarily taxonomic in nature.

It was not until the 1950s that ecological studies of Missouri's caves and their associated fauna were made. Reynolds (1959) made a preliminary study of the ecology of some Benton County caves. Oesch and Hansen (1960) and Pembleton and Bake (1967) each studied the ecology of a single cave: Cat Hollow Cave, Dallas County and Maze Cave, Dade County, respectively. A study by Schwartz (1976) briefly discussed the ecosystem of Cathedral Cave, Crawford County.

Scattered records of Missouri's subterranean invertebrate fauna exist in the literature, but there were no concise summaries of species distribution and occurrence in publicly managed caves. The early species lists of Hubricht (1950) and Nicholas (1960) served to stimulate much further research on Missouri's cave fauna. Lewis (1974) produced an annotated list of invertebrates from Mystery and other caves in Perry County. Pflieger (1974) provided an annotated list of 69 species known to inhabit Missouri springs and their subterranean sources, but was limited to records of amphipods, isopods, crayfish, snails, other aquatic invertebrates, salamanders, frogs and fishes. Craig (1975) reviewed cave fauna reports for Missouri and later (1977) completed a list of invertebrate fauna of caves that would have been inundated by the now-deauthorized Meramec Park Lake on the Meramec River in east-central Missouri.

Regional studies have contributed much to the understanding of Missouri's cave fauna and their geographical affinities (Barr, 1963; Bishop and Crosby,

1926; Elliot and Strandtmann, 1971; Ferguson, 1978; Hobbs *et al.*, 1977; Shear, 1969). Peck and Lewis (1978) provided data on zoogeography and evolution of subterranean invertebrate fauna of Illinois and selected southeastern Missouri counties. Marquart (1979) completed a survey of the troglobitic crayfish of Missouri. Craig (pers. comm.) conducted a study of the subterranean invertebrates of the Ozark Plateau and is preparing to publish his findings.

Records of invertebrate cave fauna for state and federally managed caves in Missouri were incomplete and insufficient. Craig (1977) provided data on nine state-owned caves in the deauthorized Meramec Park Lake area. Additional records from state and federally managed caves were scattered throughout the literature (Hubricht, 1943; Hubricht and Mackin, 1940, 1949; Lewis, 1981; Marquart, 1979; Schwartz, 1976; Steeves, 1966). Despite these records, there were no concise base line data for subterranean invertebrate species in publicly owned caves.

It was the primary objective of this study to provide data on systematics, occurrence, natural history and geographic distribution of subterranean invertebrate fauna from selected Missouri caves and springs. This quantitative information was expected to create a limited data base for future evaluations of habitat degradation and species detriment. This study may provide an incentive to promote basic research by identifying cave fauna of interest, and to generate taxonomic studies by providing additional specimens to systematists.

Another purpose of this investigation was to identify species which need special protective management (e.g., rare species, species having very limited distributions, and species gene pools in type localities). Additionally, this study was conducted as a contribution toward a better understanding of Missouri's subterranean invertebrate fauna and to the cave fauna of east central North America.

Records presented in this study were based on extensive collections of more than 4,500 invertebrate specimens, combined with species determinations and contributions from 60 invertebrate systematists. Some 414 invertebrate species were identified as a result of these collections. This work was not intended to be a definitive publication of Missouri's cavernicolous fauna, but rather to provide a basis upon which further studies could be built.

Geological, Physiographical and Natural Divisions of Study Areas

THOM AND WILSON (1980) divided Missouri into six major divisions by combining geology, soils, topography, plant and animal distributions, presettlement vegetation and other natural factors (Figure 1). Their descriptions of these divisions were combined with descriptions given by Bretz (1956) and Vineyard and Feder (1974) to fully illustrate the diversity characteristic of study areas.

The principal cavernous and spring-bearing areas of Missouri are in the Ozark Plateau's physiographical province (Figure 2). The Ozarks have been a continuous, uplifted land area since Pennsylvanian time (Bretz, 1965). Prevailing rock types are calcareous, allowing cave development, and are capable of storing and transmitting large quantities of water through spring outlets. The Ozark Plateau's province may be further defined by several recognized subdivisions. Three subdivisions (Figure 2) found in Missouri are: 1) the Salem Plateau; 2) the St. Francois Mountains; and 3) the Springfield Plateau (Bretz, 1965).

The Salem Plateau, largest of the three subdivisions, is an unglaciated, highly dissected region underlain primarily by limestones and dolomites of upper Cambrian and Ordovician age, but with rock ranging through Mississippian age. Highly soluble Gasconade, Eminence and Potosi Dolomites are the most common types of rock from which large springs issue, and make possible extensive cave systems (Vineyard and Feder, 1974). The cave-containing stream valleys of the eastern and southern slopes are deeper and more ruggedly dissected than the streams of the northern and western slopes (Bretz, 1965). Additionally, springs of the southern and eastern slopes are larger and more abundant (Vineyard and Feder, 1974). According to Thom and Wilson (1980), presettlement vegetation was deciduous upland, pine-oak, and pine forests. Examples of endemic cavernicoles found in the Salem Plateau are *Cambarus hubrichti* Hobbs (Decapoda: Cambaridae), *Caecidotea salemensis* Lewis (Isopoda: Asellidae), and *Typhlotriton spelaeus* Stejneger (Caudata: Plethodontidae). The most southerly of the Pleistocene glaciations in Missouri, the Kansas, reached only to the northern border of the

Salem Plateau (Figure 2).

The St. Francois Mountains subdivision (Figure 2) is characterized by high peaks and conical knobs with underlying precambrian granite, rhyolite, and felsite (Thom and Wilson, 1980). This island of crystalline rock forms the center of the Ozark Dome of Paleozoic marine sediments, which largely covered them (Bretz, 1965). Springs and caves in this area are limited to dolomites and sandstones in the basins between the knobs. Original vegetation was pine, mixed pine-oak and deciduous forests and glades (Thom and Wilson, 1980). Cavernicoles characteristic of the surrounding Salem Plateau are expected to occur there.

The Springfield Plateau subdivision (Figure 2) of the Ozark Plateau's physiographical province is characterized by limestones and dolomites, primarily of Mississippian age, and underlain by Ordovician dolomites (Bretz, 1965). The Springfield Plateau is much flatter and less dissected than the Salem Plateau. Springs on the Springfield Plateau are much smaller and issue from Mississippian limestone (Vineyard and Feder, 1974). Presettlement prairie, deciduous forests, glades and savannahs were characteristic of this region (Thom and Wilson, 1980). Examples of endemic cavernicolous fauna are *Cambarus setosus* Faxon (Decapoda: Cambaridae) and *Amblyopsis rosae* (Eigenmann) (Perciformes: Amblyopsidae).

Some study caves were located within the Lincoln Hills Section (Figure 2) of the Glaciated Plains Division. This Section is characterized by areas which probably escaped influence by the Kansas stage of Pleistocene glaciation. Upland deciduous forests were the predominant presettlement vegetation (Thom and Wilson, 1980). The flora and fauna of this section have close affinities to the Ozarks. Underlying bedrock of Ordovician and Mississippian age are exposed in areas of steep topography. The only known cavernicole found within this Section, but not found elsewhere in Missouri, is *Mundochthonius cavernicolus* Muchmore (Pseudoscorpionida: Chthoniidae).

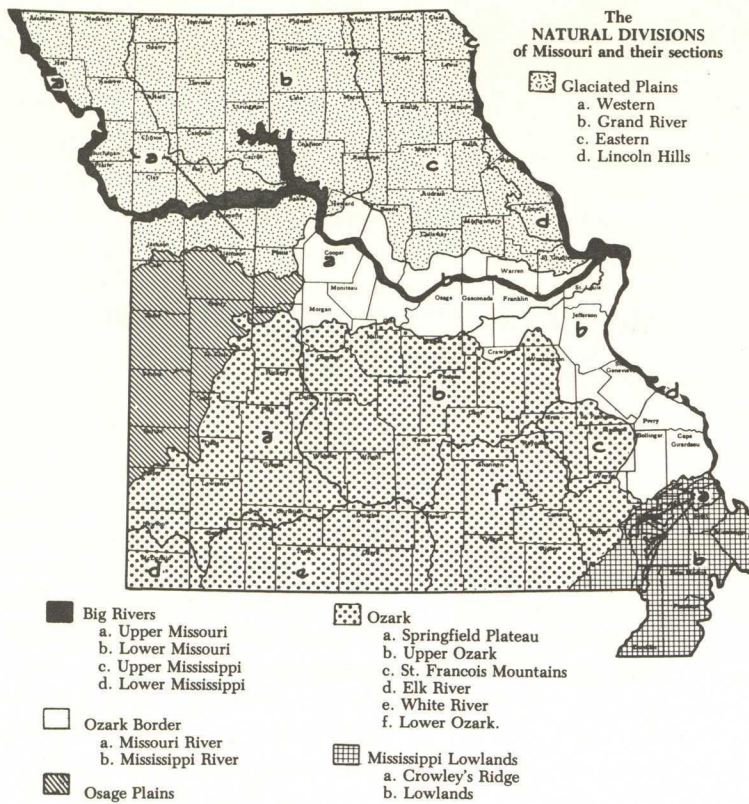


Figure 1. The Natural Divisions of Missouri. From Thom and Wilson (1980).

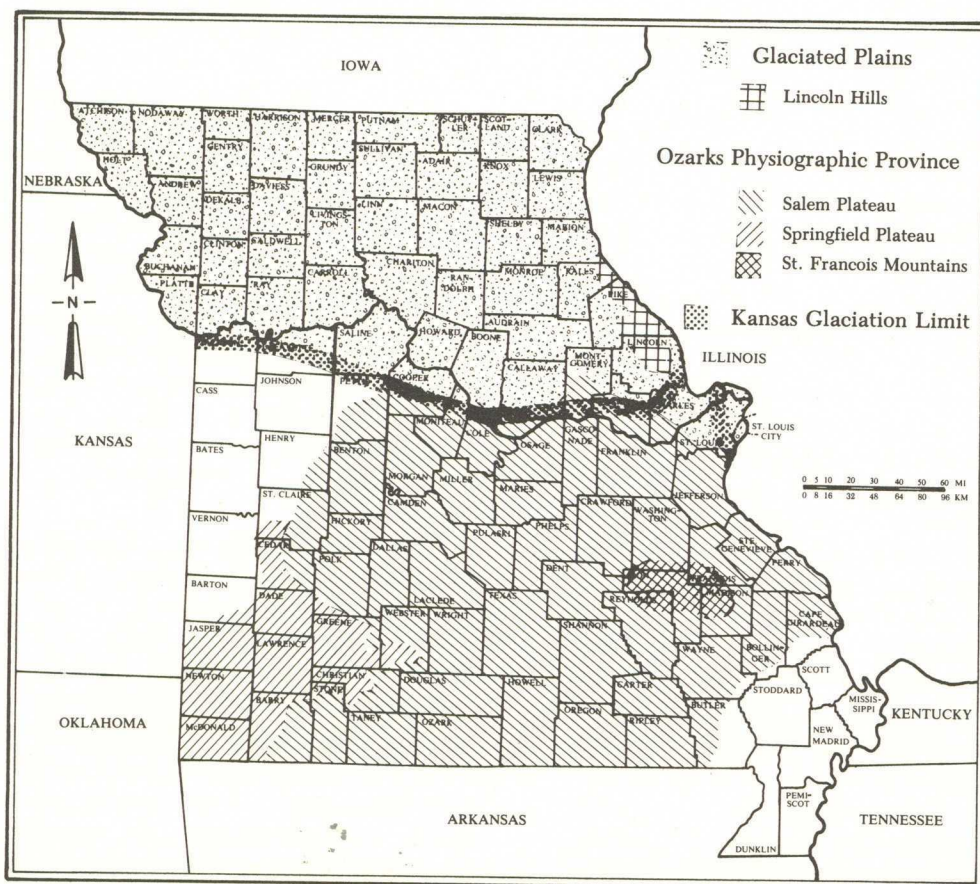


Figure 2. Geological and physiographical provinces of Missouri containing study caves, and illustrating the southern limits of the Kansas glaciation. From Bretz (1965) and Vineyard and Feder (1974).

Biological Investigation

There are more than 4,400 caves (Vineyard, 1984) and countless numbers of springs in Missouri. Data presented in this study are from the biological inventory of 436 caves and 10 springs found in 38 counties in Missouri (Figure 3).

Descriptions of many caves and springs, from which specimens were collected, can be found in various issues of *Missouri Speleology* [Vols. 1(1), 1(2), 2(2), 9(4) and 16(4)]. A number of study caves have been described by Bretz (1965), Beveridge (1980), and Weaver and Johnson (1980). Vineyard and Feder (1974) described the springs of Missouri.

Collecting efforts were usually limited to a one-time visit to each cave. Baited pitfall traps were not used during the study, and only on one occasion were Berlese samples taken. During the investigation of Onondaga Cave, Crawford Co., dung from a domesticated striped skunk (*Mephitis mephitis*) was used to lure cavernicoles to bait stations within the cave.

Each cave was searched extensively and limited collections of invertebrates made. Specimens were collected entirely by hand search and capture methods, using a small artist's brush, forceps, aspirator, and small aquarium net and suction device for aquatic organisms. Ecological and natural history data were recorded, as well as selected environmental data.

Collections of particular taxa were not consciously avoided, with the exception of Oligochaeta, Turbellaria and Culicidae (Diptera). Oligochaetes were not collected because they occur so sporadically and are edaphobitic (inhabitants of soil). Turbellarians could not be properly submitted for identification because of the extreme remoteness of the caves visited and time needed to carefully prepare them for shipment. All Culicidae commonly overwinter in caves, and species records follow known epigeal distributions.

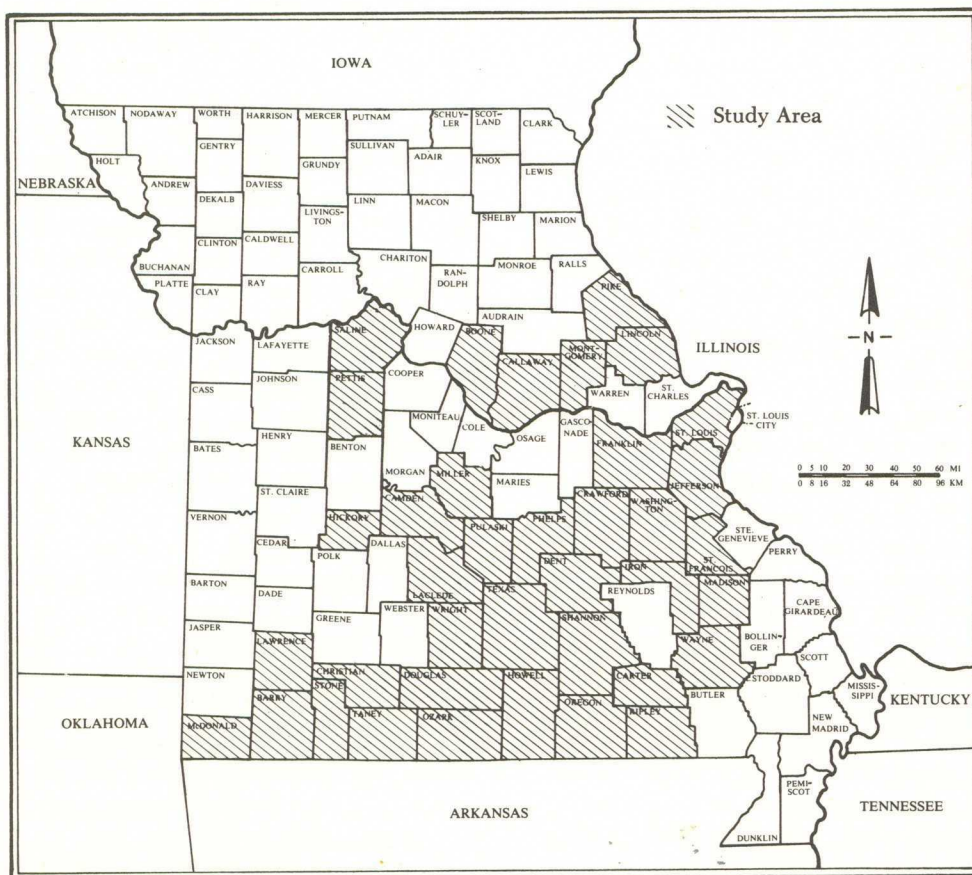


Figure 3. Counties including the 436 study caves and ten springs visited during this study.

Annotated List of Invertebrate Fauna

To provide a more complete and useful understanding of each cave organism, each species' probable ecological position in the cave environment has been described. The historic classification system of Schiner (1853) and Racovitza (1907) have undergone much discussion. Alternate patterns of terminology and descriptive categories have been proposed (Barr 1960, 1963, 1968; Hamilton-Smith, 1971; Holsinger, 1969).

The four ecological classifications of cavernicoles used in this study follow the system of Barr (1968). The commonly used terms are: (1) *Troglobites*, or obligatory species which can live only in cave habitats and are unable to exist in epigeal environments. They usually show specialized morphological adaptations (e.g., depigmented, non-functional eyes, and hypertrophy of certain sense organs). (2) *Troglophiles* are commonly found in caves and complete their life cycle there, but are capable of existing in ecologically similar, non-cave habitats (e.g., beneath a house, deep in forest litter, and under logs and rocks). (3) *Trogloxenes* commonly occur in caves for shelter and favorable microclimate, but must periodically leave the cave to complete their life cycle (e.g., feeding and/or reproduction). (4) *Accidentals* cannot normally survive in caves and usually have fallen, been washed, or wandered into a cave. Accidentals do not play an important role in cave species associations or total fauna distribution, but may serve as food sources for other cave inhabitants. They are included in this study, because they serve as records which may influence their future classification in the cave ecosystem, and several represent significant taxonomic materials. Abbreviations representing the ecological classification of species are as follows: TB=Troglobite; TP=Troglophile; TX=Trogloxene; AC=Accidental. The exact ecological roles of many species are not fully understood. The classification of certain taxa is a tentative one and should be reconsidered when more data are available.

The more conventional divisions of cave zones are based on amounts of light, temperature fluctuations and humidity. These zones are the twilight zone, middle zone and zone of total darkness. For the purpose of this study, the following zonation classifications for caves were employed: 1) *Entrance Zone*, or that area of cave immediately associated with the outside environment, and equally

subjected to seasonally fluctuating environmental parameters of the surface. The entrance zone is practically indistinguishable from the surrounding epigeal environment. 2) *Twilight Zone*, or that area of a cave extending from the entrance to the deepest part of a cave's passageway where unaided human vision is still possible. Green plants may characterize this zone, and this zone usually exhibits a sharp demarcation from the zone of total darkness. 3) *Total Darkness Zone* is the area of a cave totally devoid of light. Temperatures approximate the average annual mean temperature of the surface environment, while humidity remains very high and constant.

Although this study presents data from over 4,500 invertebrate specimens collected from Missouri's subterranean habitats, it is by no means complete. Some taxa are still poorly known to systematists and could not be identified to species level (e.g., *Apochthonius* and *Lirceus*). Materials of certain taxonomic groups have not yet been sorted, or submitted to systematists for identification for lack of a known authority. Other specimens require more detailed study, and determinations of some materials submitted to taxonomists are not yet available (e.g., Acari, Thysanura). Several specimens represent undescribed species that have not yet been fully studied and described. Determinations of some materials require taxonomic characteristics found in other life stages.

Records presented here represent materials collected from study caves and subsequently identified by the invertebrate taxonomists listed in the acknowledgments section of this study. Currently accepted names were utilized. Whenever possible, previously published records, unpublished data and specific comments from systematists appear in species annotations. Locality records for Missouri cave fauna based on erroneous identifications were not included in this study.

Occasionally, cave names utilized in this study did not agree with previously published records. In each case, currently accepted names were used.

In accordance with previous studies, taxa were arranged in phylogenetic order. Families, genera within families, and species within genera are listed alphabetically. Moreover, counties are listed alphabetically as are collection sites (caves, springs, etc.) within each county.

Phylum Nematomorpha

Class Gordiodea

Order Gordioida

Family Gordiidae

Gordius sp., TX

Pulaski County: Knife Cave and Little Cave.

Texas County: John's Dilemma Cave. **Wash-**

ington County: Chara Cave. Adults live almost anywhere in water if oxygen is adequate.

The larvae are parasitic in arthropods (Hickman, Hickman and Hickman, 1974). Adults were taken from a stream near the entrance, as were adults reported from Arkansas caves (McDaniel and Smith, 1976).

Phylum Platyhelminthes

Class Turbellaria

Order Tricladida

Family Planariidae

Dugesia sp., prob. *tigrina* (Girard), TX.

Shannon County: Blue Spring. This species was collected from the surface pool in daylight and is probably an inhabitant of more springs in Missouri. Hyman (1956) said *Dugesia* is the most common genus of freshwater planarians found in lakes, ponds and streams of all continents.

Macrocotyla glandulosa Hyman, TB.

Boone County: Devils Icebox Cave. This endemic turbellarian was seen very infrequently in the cave. The population has apparently been decreasing in recent years, and in the fall of 1981 a great number of them were killed by Dieldrin (Scott Schulte, pers. comm.). This species was actually described from specimens collected below the outlet of a cave (Hyman, 1956).

Phylum Annelida

Class Clitellata

Order Hirudinea

Family Glossiphoniidae

Piscicola punctata (Verrill), TX.

Shannon County: Blue Spring. This leech was collected on the bottom of the spring pool in daylight. Leeches have been found in caves in Perry and Ste. Genevieve counties in Missouri (Peck and Lewis, 1978). Hubricht (1950) reported them from sinkhole and tunnel caves in the Ozarks. *Piscicola punctata* is chiefly reported from the northern United States and Canada, but is infrequently encountered elsewhere (Klemm, 1982).

Placobdella ornata (Verrill), TX.

Shannon County: Blue Spring. This is a second species of leech found by divers in the daylight of the spring pool. The genus *Placobdella* is adapted to several aquatic habitats (Harp, pers. comm.) and is common and widespread throughout the northern half of the United States and Canada (Klemm, 1982).

Placobdella parasitica (Say), TX.

Pulaski County: Great Spirit Cave. Found just inside the entrance in the stream where it could feed easily on *Crangonyx forbesi* Hubricht and Mackin (Amphipoda: Crangonyctidae). This species is common and widely distributed throughout the United States and Canada (Klemm, 1982).

Placobdella sp., TX.

Oregon County: Cooper Spring Cave and Leech Spring Cave. The specimen from Cooper Spring Cave was collected from a rock in the entrance pool. Leech Spring Cave was named for the abundance of leeches found on sticks in a pool of the small spring flow, near the entrance. The specimen from Leech Spring Cave had many young clinging to it.

Phylum Mollusca

Class Gastropoda

Order Basomatophora (Pulmonata)

Family Carychiidae

Carychium exile (H.C. Lea), TB.

Texas County: Unnamed Cave No. 2. This tiny terrestrial snail was found on wet rotting wood in the twilight zone. The species is widespread in the eastern United States. Hubricht (1950) reported finding this species abundantly in River Cave, Camden County, Missouri. *C. stygium* Call is an abundant terrestrial troglobite in the Mammoth Cave region (Barr, 1960).

Family Lymnaeidae

Lymnaea sp., TX.

Shannon County: Blue Spring. Specimens were collected in the sunlight in the surface pool of the spring with three other species of snails.

Family Physidae

Physa sp., TP.

Boone County: Devils Icebox Cave and Polly's Pot Cave. **Camden County:** Camp Rising Sun Cave. **Carter County:** Turley Cave. **Christian County:** White Worm Spring Cave. **Dent County:** Bounds Branch Cave. **Franklin County:** Camp Cave. **McDonald County:** Long Cave. **Oregon County:** Cooper Spring Cave and Leech Spring Cave. **Phelps County:** Kaintuck Hollow Natural Bridge Cave. **Pulaski County:** Great Spirit Cave. **Shannon County:** Blue Spring and Jam Up Cave. **Texas County:** John's Dilemma Cave. Specimens were collected most often from organic materials in streams near the entrance. Hubricht (1950) encountered *Physa* sp. in several tunnel caves where they had washed in, apparently adapted themselves to the darkness, and were multiplying. Several individuals were observed in small muddy bottom pools of a breakdown stream in the total darkness of Devils Icebox Cave, along with several well-mature egg clusters.

Family Planorbidae

Menetus sampsoni (Ancey), TX.

Camden County: Camp Rising Sun Cave. Two specimens were collected from a shallow pool of water on a rock shelf in total darkness. These temporary pools are created when Lake of the Ozarks reaches flood level.

Order Mesogastropoda (Ctenobranchiata)

Family Hydrobiidae

Fontigens aldrichi (Call and Beecher), TB.

Carter County: Cat Track Cave. **Crawford County:** Cathedral Cave and Onondaga Cave. **Dent County:** Bounds Branch Cave. **Franklin County:** Camp Cave, Copper Hollow Spring Cave and Fisher Cave. **Iron County:** Cave Hollow Cave. **Oregon County:** Bluehole Cave. **Phelps County:** Coon Cave No. 3 and Hanley Cave. **Shannon County:** Blue Spring and Wind Cave. **St. Francois County:** Falling Rock Spring Cave. **Texas County:** Bear Cave. **Washington County:** Camp Branch Cave. This tiny aquatic snail is probably overlooked in many caves and springs, where it is found most often beneath rocks in water. The specimens from Bounds Branch Cave were found on the undersides of rotting leaves. Specimens from Camp Branch Cave and Bluehole Cave were taken from rotting wood. Hubricht (1941) noted the apparent lack of organic detritus in streams where these snails are found. The specimens from Blue Spring were found at a depth of 28 meters. Peck and Lewis (1978) reported this species from springs in St. Louis and Jefferson counties. It was previously reported from caves in Crawford and Washington counties by Hubricht (1940, 1941) and additional caves in Crawford and Franklin counties (Craig, 1977). This species is apparently widespread in many more Missouri counties and offers an interesting research problem on ecology, habitat preference and size variation.

Family Pleuroceridae

Goniobasis potosiensis Lea, TX.

Washington County: Mossy Spring Cave. This species has not been previously recorded from Missouri caves. It was extremely abundant on the rocks and rubble of the stream just inside the entrance.

Goniobasis potosiensis ozarkensis (Call), TX.

Camden County: Island Pit Cave. **Phelps County:** Maramec Spring. **Shannon County:** Blue Spring and Larkin Ford Cave. **Washington County:** Camp Branch Cave. This snail was far more abundant than *Physa* sp. in Blue Spring and was found at depths of 21 meters. This species co-occurred with *Fontigens aldrichi* in the small stream of Camp Branch Cave. The specimen from Larkin Ford Cave was found far from the entrance in total darkness in a small pool. The specimens from Maramec Spring were killed when an ammonia pipeline broke, contaminating ground water.

Order Stylommatophora

Family Bulimulidae

Rabdotus dealbatus (Say), TX.

Texas County: Unnamed Cave No. 1. This previously unreported species from Missouri caves was found on the floor of this short, tunnel-like cave in total darkness.

Family Cionellidae

Cionella morseana Dowerty, TX.

Barry County: Lignite Cave. This species was collected from beneath animal feces in twilight.

Family Discidae

Anguispira alternata (Say), TX.

Camden County: Counterfeiters Cave. **Iron County:** Boulder Cave, Crooked Creek Cave, Peter Cave No. 2 and Wasp Cave. **Miller County:** Travertine Spring Cave. All specimens reported here were collected near the entrance in twilight.

Discus nigrimontanus (Pilsbry), TX.

Christian County: Infant Maze Cave. **Howell County:** Jim Ridge Cave. This species was found in leaf litter very near the entrances.

Family Haplotrematidae

Haplotrema concavum (Say), AC.

Pulaski County: Peninsula Cave. This species was found in leaf litter below the sinkhole entrance of the cave, where it had fallen in.

Family Helicodiscidae

Helicodiscus notius notius Hubricht, TP or TX?

Camden County: Gar Cave, River Cave and Sassafras Cave. **Lawrence County:** Turnback Cave. **Pettis County:** Quarry Pit Cave. **Washington County:** Rattlesnake Pit Cave. This small, partially clear-shelled snail was collected from leaves and sticks in the twilight and total darkness and from bat guano in total darkness.

Family Limacidae

Derocerus laevis Rafinesque, TX.

Pike County: DuChemin Cave. **Washington County:** Pipe Spring Cave. Specimens were collected in April from rotting wood and leaf litter in the cave streams.

Family Philomycidae

Megapallifera ragsdalei (Webb), TP?

Barry County: Panther Cave. **Camden County:** Kings Onyx Cave. **Carter County:** Cradle Hollow Cave, Mitchell Hollow Cave, Norris Cave and Spout Spring Cave. **Crawford County:** Jagged Canyon Cave and Onondaga Cave. **Dent County:** Bounds Branch Cave. **Hickory County:** Stovepipe Cave. **Howell County:** Willow Branch Cave. **Iron County:** Peter Cave No. 2. **Oregon County:** Big Dome Cave and Wolf Den Cave. **Ozark County:** Onyx Cave. **Phelps County:** Arches Natural Tunnel, Tree Root Cave and Zorumski Cave. **Pulaski County:** Little Cave and Peninsula Cave. **St. Louis County:** Overhang Cave. **Shannon County:** Barn Hollow Cave, Branson Cave and Secret Cave. **Taney County:** Scenic Drive Cave. **Texas County:** Unnamed Cave No. 15 Annex. **Wright County:** Bill Dyer Lead Mine Cave. Although most commonly found on the ceiling near the entrance, specimens were collected from wet leaves and sticks found in all cave zones. Of interest was the specimen from Jagged Canyon Cave which had left a slime trail on the bottom of a pool in the stream. The trail was over thirty-five centimeters long beneath the water. Other members of Philomycidae have been reported from Crawford County caves (Craig, 1977).

Pallifera fosteri F. C. Baker, TX.

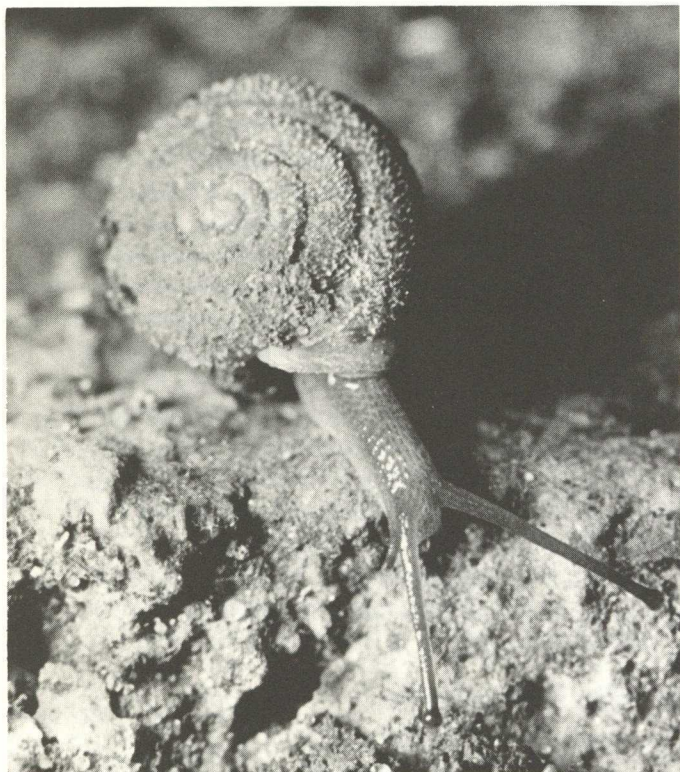
Washington County: Chara Cave. A single specimen was found beneath a stone in twilight.

Family Polygridae

Mesodon inflectus (Say), TP.

Barry County: Last Cave, Moonshine Hole Cave and Piney Creek Cave. **Camden County:** Fort Cave, Gar Cave and Sassafras Cave. **Carter County:** Blue Spring Cave. **Christian County:** Infant Maze Cave. **Franklin County:** Hidden Room Cave. **Howell County:** Boulder Cave and Ralph Ridge Pit Cave. **Iron County:** Crooked Creek Cave and Peter Cave No. 2. **Miller County:** McDowell Cave and Travertine Spring Cave. **Oregon County:** Camp House Cave, Cat Cave, Corbet Cave, Dead Man Cave, Panther Cave and Statue Cave. **Ozark County:** Goat Cave. **Phelps County:** Arches Natural Tunnel and Zorumski Cave. **Shannon County:** Davis Cave and Tater Cave. **Texas County:** Spring Cave No. 32, Unnamed Cave No. 1, Unnamed Cave No. 10, Unnamed Cave No. 13, Unnamed Cave No. 14, Unnamed Cave No. 14 Annex, Unnamed Cave No. 15 and Unnamed Cave No. 15 Annex. This terrestrial species was collected

from a wide variety of habitats in all zones within the caves. It was found most often associated with leaf litter. The specimen from Zorumski Cave was apparently feeding on a dead cricket (*Ceuthophilus* sp.) and the one from Unnamed Cave No. 15 Annex had a moth wing clasped in its mouth. This species was previously known from caves in Benton County (Reynolds, 1959), Crawford County (Craig, 1977), Ste. Genevieve County (Peck and Lewis, 1978) and Taney County (Hood and Hawksley, 1975) Missouri. It has also been reported from a single cave in Illinois (Peck and Lewis, 1978) and several caves in Alabama and Kentucky (Hubricht, 1964).



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Mesodon inflectus is a troglophilic species ranging over much of Missouri. It was collected from a wide variety of habitats in all zones within the caves visited. This species is among the most commonly encountered Gastropoda in Missouri caves.

Mesodon sp., prob. *inflectus* (Say), TP.

Franklin County: Mine Cave. **Laclede County:** Mayfield Cave. These specimens were immature and could not be identified to species.

Mesodon perigraptus (Pilsbry), TX.

Crawford County: Scotia Cave. One specimen was found near the entrance and another in total darkness.

Mesodon zaletus (Binney), TX.

St. Louis County: Woods Cave. This species was found near the entrance in leaf debris and rotting wood.

Mesodon sp., or *Triodopsis* sp., TP or TX?

Barry County: Last Cave, Piney Creek Cave and Trailside Spring Cave. **Camden County:**

River Cave. **Carter County:** Buzzard Cave. **Franklin County:** Coon Cave and Mack Cave. **Iron County:** Cave Hollow Cave Annex, Crooked Creek Cave and Peter Cave No. 2. **Jefferson County:** Bollefer Spring Cave. **Miller County:** Potato Cave and Travertine Spring Cave. **Oregon County:** Big Dome Cave, Boulder Canyon Cave, Cat Cave, Statue Cave and Wolf Den Cave. **Phelps County:** Coon Cave No. 2 and Pillman Cave. **Pike County:** DuChemin Cave. **Pulaski County:** Knife Cave. **Shannon County:** Bluff Cave and Den Cave. **Washington County:** Park Cave. These specimens represent immature individuals which could not be identified to species. These two genera are apparently closely related.

Polygra dorfeuilliana (Lea), TX.

Camden County: My Cave. **Texas County:** Unnamed Cave No. 1. One specimen was collected from the floor in total darkness and the other from leaf litter near the entrance.

Triodopsis alleni (Wetherby), TX.

Barry County: Rock Wall Cave. **Carter County:** Devils Run Hollow Cave. **Taney County:** Pinnacle Mine. **Wayne County:** Eagle Rock Cave. This large species of terrestrial snail was collected mainly from the wall near the entrance. This species has not been previously reported from Missouri caves.

Triodopsis fosteri (F. C. Baker), TP or TX?

Crawford County: Stairstep Cave. **Franklin County:** Camper Spring Cave. Peck and Lewis (1978) recorded this species from a cave in Union County, Illinois, and questioned its classification as a troglophile. All specimens reported here were found on the floor in the twilight zone.

Triodopsis sp., TP or TX?

Crawford County: Bat Cave and Bear Cave. These immature specimens were all collected from the twilight zone.

Undetermined genus and species, TP or TX?

Howell County: Willow Branch Cave and Tabor Cave. **Phelps County:** Gable Spring Cave. **St. Louis County:** Overhang Cave. **Shannon County:** Bear Cave. **Taney County:** Scenic Drive Cave. These specimens of Polygridae were too immature for species determinations.

Family Pupillidae

Gastrocopta armifera (Say), TP.

Howell County: Willow Branch Cave. **Phelps County:** Zorumski Cave. This previously unreported species was collected from wet leaves and eastern wood rat (*Neotoma floridana*) droppings in total darkness.

Family Vertiginidae

Vertigo meramecensis Van Devender, TX.

Crawford County: Bat Cave. This species was described by Van Devender (1979) from surface materials in Crawford County, Missouri. Frest and Fay (1981) discovered the species in 3 counties in northeastern Iowa, a distance of 480 kilometers north of the type locality. Hubricht (pers. comm.) said the specimen from Bat Cave has the sculpture of *V. meramecensis*, but had been injured behind the lip, therefore the lip and teeth did not develop properly. This specimen was collected from rotting wood in total darkness.

Family Zonitidae

Glyphyalinia indentata (Say), TX.

Carter County: Secesh Cave. **Christian County:** Rattlesnake Cave. **Crawford County:** Onondaga Cave. **Howell County:** Willow Branch Cave. **Washington County:** Pipe Spring Cave. This species was found in wet leaves in total darkness in Willow Branch Cave.

Glyphyalinia lewisiana (Clapp), TX.

Crawford County: Narrows Cave. **Taney County:** Zoo Cave. All specimens were collected from leaves near the entrance.

Glyphyalinia wheatleyi (Bland), TX or AC?

Barry County: Deer Leap Cave. **Camden County:** Island Pit Cave. **Oregon County:** Kelley Hollow Cave. One specimen was found in leaves and sticks below the pit entrance, where it could have fallen in, but one specimen was collected far into total darkness.

Paravitrea significans (Bland), TX.

Camden County: Island Pit Cave. **McDonald County:** Long Cave.

Zonitoides arboreus (Say), TP or TX?

Camden County: River Cave. **Crawford County:** Little Crystal Cave. **Howell County:** Ralph Ridge Pit Cave. Specimens were found in moist leaves in twilight and wet rotting wood in total darkness. This species is known from caves in Arkansas (Youngsteadt and Youngsteadt, 1978), Illinois (Peck and Lewis, 1978) and caves in other eastern states (Hubricht, 1964, 1968). In Missouri, it has been previously recorded from caves in Benton, Crawford, Washington and Perry counties (Craig, 1977; Hubricht, 1941; Peck and Lewis, 1978; Reynolds, 1959).

Zonitoides kerbyi Fullington, TX or AC?

Camden County: Ozark Caverns and My Cave. **Christian County:** Moonshine Still Cave. **Pulaski County:** Ryden Cave. Specimens were collected from leaves near the entrance of Moonshine Still Cave and below the pit

entrance to Ryden Cave. Four specimens were collected from a fungus-ridden, wooden railing in Ozark Caverns.

Phylum Arthropoda Class Crustacea Order Isopoda

Suborder Asellota

Family Asellidae

Caecidotea ancyla/serratus intermediate, TB.

Camden County: Honey Run Cave and Ozark Caverns. The specimens from Ozark Caverns were collected from beneath wood in the cave stream. *Caecidotea salemensis* Lewis was collected from small muddy bottom drip pools. A similar situation occurs in Branson Cave, Shannon County, where *Caecidotea salemensis* was found in rimstone drip pools and *Caecidotea serrata* Flemming occurred in the muddy bottom stream.

Caecidotea antricola Creaser, TB.

Camden County: River Cave. **Carter County:** Cradle Hollow Cave, Lower Camp Yarn Cave, Secesh Cave and Turley Cave. **Crawford County:** Cathedral Cave, Jagged Canyon Cave, Narrows Cave and Onondaga Cave. **Douglas County:** Still Spring Cave. **Franklin County:** Bear Cave. **Howell County:** Jim Ridge Cave and Mud Spring Cave. **Iron County:** Cave Hollow Cave. **Laclede County:** Coffin Cave. **Oregon County:** Bluehole Cave, Dead Man Cave, Greer Spring Cave, Statue Cave, Turner Spring Cave and Willow Tree Cave. **Ozark County:** Bear Cave. **Phelps County:** Maramec Spring. **Pulaski County:** Folly Cave, Great Spirit Cave, Killman Cave, Knife Cave, Ryden Cave and Stockpen Cave. **Shannon County:** Bat Cave, Beaver Den Cave, Little Gem Cave, Powder Mill Creek Cave, Round Spring Caverns, Secret Cave, Sycamore Cave, Tater Cave and Williams Ford Cave. **St. Francois County:** Falling Rock Spring Cave. **Texas County:** John's Dilemma Cave and FS Cave 130. **Washington County:** Brazil Pit Cave, Camp Branch Cave, Great Scott Cave, Little Scott Cave and Mossy Spring Cave. This species apparently inhabits a wide variety of habitats. They were collected from pools and riffles of cave streams and in rimstone pools. River Cave, Camden County, is the type locality for this species (Creaser, 1931). According to Lewis (pers. comm.) this species is found through

much of the Salem Plateau and is probably the most common cave isopod in the Ozarks. It has been reported previously from caves in a number of Missouri counties, including Camden, Christian, Crawford, Greene, Perry, Phelps, Ste. Genevieve, Shannon, Taney, Washington and Wright (Aley and Thompson, 1971; Lewis 1974; Lewis and Bowman, 1981; Peck and Lewis, 1978; Steeves, 1966). This species is also known from Arkansas caves (McDaniel and Smith, 1976; Steeves, 1966; Youngsteadt and Youngsteadt, 1978). Smith (1977) discussed aspects of the life history of this species in an Arkansas cave stream using the name *Asellus antricolus* (Creaser), the name most previous records of this species referred to.

This species was uncommonly seen in Onondaga Cave, but the use of dung bait proved successful in attracting a number of specimens. The Phelps County specimens from Maramec Spring were collected after they were killed by an ammonia pipeline rupture, and flushed from the spring. This species is apparently endemic to the Salem Plateau, where it can be found under stones, crawling across gravel and mud-bottom pools of cave streams, or occasionally in drip pools (Lewis and Bowman, 1981).

Caecidotea brevicauda (Forbes), TP.

Boone County: Conners Cave, Devils Icebox Cave, Polly's Pot Cave, Rockbridge Cave, a concrete spring box near Rockbridge (surface) and Walled Spring (surface). **Callaway County:** Spaghetti Cave. **Lincoln County:** Creech Cave. **Miller County:** DeGraffenreid Spring and McDowell Cave. **Saline County:** Arrow Rock Cave. **Warren County:** Surface Stream. **Washington County:** Pipe Spring Cave. This species was abundant in the Rockbridge, Conners, Devils Icebox and Polly's Pot cave system, which is hydrologically connected. A great number of this species (and other aquatic invertebrates) were destroyed in Devils Icebox Cave and downstream by Dieldrin (Scott Schulte, pers. comm.).

Specimens from Devils Icebox Cave and Polly's Pot Cave were partially unpigmented. Nearly all specimens were collected from beneath stones, leaves, or sticks.

This epigeal troglophile is known from creeks, drain tiles, springs and seeps in the following Missouri counties: Boone, Camden, Franklin, Jefferson, St. Charles, Ste. Genevieve and St. Louis (Mackin and Hubricht, 1938; Peck and Lewis 1978). It is previously known from caves in Boone County (Williams, 1970), but commonly found in Perry County caves (Lewis, 1974). It was reported as quite common in Illinois caves (Peck and Lewis, 1978).

Caecidotea sp., prob. *brevicauda* (Forbes), TP.

St. Louis County: Rockwoods Spring Cave. This identification was based on a female specimen. However, male specimens are needed for adequate determinations.

Caecidotea dimorpha Mackin and Hubricht, TB?

Barry County: Mushroom Rock Cave. Males and females of this species were collected from beneath stones in riffles of the small cave stream. This species co-occurred with *Lirceus* sp., *Crangonyx* sp. (*forbesi* group), and *Stygobromus ozarkensis* (Holsinger) in the cave stream.

Caecidotea dimorpha is a morphologically unusual species which has been collected in only a couple of locations since Mackin and Hubricht first described it (Lewis, pers. comm.). The description was based on specimens with eye pigment spots from a seep in Wayne County, Missouri. Eye pigment spots were absent in specimens from Jackson County, Arkansas, which came from a small spring on a hillside. McDaniel and Smith (1976) reported this species from Searcy County, Arkansas, under the name *Asellus dimorphus* (Mackin and Hubricht, 1938), but gave no specific location.

Rare and Endangered Species of Missouri (1984) listed *C. dimorpha* as rare or very localized in distribution, being known only from a spring seep in Wayne County, Missouri and a spring in Jackson County, Arkansas. This record from Mushroom Rock Cave in southwestern Missouri, represents a westward range extension for the species. A great deal more study is required to fully understand the distribution of this morphologically unusual, subterranean species.

Caecidotea foxi/laticaudata intermediate, TP.

Camden County: Camp Rising Sun Cave. These specimens were collected from small isolated pools in rock shelves along the walls. Camp Rising Sun Cave backfloods completely during flood stages of Lake of the Ozarks. Massive amounts of organic debris were present in the cave. *Caecidotea foxi* and *C. laticaudata* are both epigeal species which are apparently taxonomically confusing.

Caecidotea fustis Lewis, TB.

Crawford County: Bear Cave, Moonshine Cave and Onondaga Cave. **Franklin County:** Lost Cave. **Washington County:** Blacksnake Hole Cave and Corral Cave. Specimens were collected from pools in streams and isolated drip pools. The specimens reported here had small eyes, particularly interesting for this species. One collection contained specimens with vestigial dorsal pigmentation (Lewis, pers. comm.). This species was described recently by Lewis (1981), from

these additional materials from caves in Crawford and Franklin counties and seeps in Franklin and Iron counties. According to Lewis, the species is known only from caves and seeps in a narrow north-south band lying between Washington and Iron counties, Missouri, within the northeastern part of the Salem Plateau. The type locality of this species is Meramec Caverns, Franklin County (Lewis, 1981).

Caecidotea salemensis Lewis, TB.

Camden County: Boat Shelter Cave, Fiery Forks Spring and Ozark Caverns. **Carter County:** Norris Cave. **Franklin County:** Wildcat Cave. **Hickory County:** Siphon Cave. **Oregon County:** Bat Cave and Blue-hole Cave. **Phelps County:** Lane Cave, Little Piney Cave and Zorumski Cave. **Pulaski County:** Little Cave and Wilson Cave No. 1. **Shannon County:** Bat Cave and Branson Cave. **Texas County:** Unnamed Cave No. 15. This species was recently described by Lewis (1981) using specimens from a deep cistern, Lawrence County, Arkansas. This species occurs widely in groundwater, caves, seeps, springs and cisterns in the Salem Plateau and a few other localities near the edge of the plateau (Lewis, 1981). He also reported *C. salemensis* from the Missouri counties of: Boone, Dallas, Douglas, Franklin, Hickory, Pettis, Pulaski, Texas and Washington. Our findings concur with that of Lewis (1981), where specimens occur usually in quiet pools in caves. Lewis and the author collected this species from Branson Cave, from rimstone pools, and *C. serrata* from the stream. The specimens from Boat Shelter Cave were not characteristically pigmented (Lewis pers. comm.).

Caecidotea serrata Flemming, TB.

Shannon County: Branson Cave (type locality). Lewis and the author collected this species from the small, muddy bottom stream flowing through the cave. Adults of this species attain a body length of only 3 millimeters. *C. salemensis* is found in this same cave, but only in rimstone pools. It is very unusual for two species of troglobitic *Caecidotea* to be found together (Lewis, pers. comm.).

Caecidotea stygia Packard, TB.

St. Louis County: Woods Cave. These extremely large specimens were very common beneath stones in the slow riffle of the cave stream. This species is also known from caves in Kentucky, Tennessee, Ohio and Indiana (Fleming, 1972) and from three caves in Illinois (Peck and Lewis, 1978). Minckley (1961) described the frequent occurrence of *C. stygia* in surface waters in Kentucky.

Caecidotea sp., poss. n. sp., TB.

Camden County: River Cave. A tiny ovigerous female was collected from rimstone pools in the cave stream in total darkness. River Cave is the type locality for *Caecidotea antricola*, and several specimens were collected in this same habitat during this study. Lewis (pers. comm.) stated that *C. antricola* females are large when ovigerous, but he has noticed tiny ovigerous females in a couple of other collections from River Cave. Lewis further stated that a male of this smaller species has not yet been found in collections. Additional collections in Camden County have indicated that the species in River Cave might be part of the *C. ancyla/serratus* taxonomic puzzle.

Caecidotea sp., TB.

Barry County: Mine Cave. **Crawford County:** Indian Cave No. 2. **Franklin County:** Indian Cave No. 2. **Ozark County:** Huffman Cave. **Shannon County:** Nill Cave. These records mainly represent immature female specimens which were unidentifiable to species. The single male specimen collected from Huffman Cave was molting at time of collection, but resembles *C. ancyla* (Lewis, pers. comm.). A larger sample of good, mature males is needed for a positive determination.

Lirceus spp., TP or TX?

Barry County: Icebox Spring, Mushroom Rock Cave, Patton Spring, Trailside Spring Cave and Sugar Silver Cave. **Christian County:** Cascade Spring Cave, Rattlesnake Cave and White Worm Spring Cave. **Oregon County:** Bockman Spring Cave. **Ozark County:** Bat Cave and Bat Spring Cave. **Pulaski County:** Great Spirit Cave and Stockpen Cave. **Taney County:** Dicus Cave and Hercules Lookout Cave. Specimens of this epigean species have been collected from riffles and pools of streams, isolated pools with muddy bottoms and deep rimstone pools, in all zones. Although Hubricht and Mackin (1949) reported five species of *Lirceus* from Missouri, the consensus among systematists was that these descriptions were too inadequate to distinguish the species. *Lirceus* spp. have been reported from caves in Arkansas (McDaniel and Smith, 1976; Youngsteadt and Youngsteadt, 1978). McDaniel and Smith (1976) reported a troglobitic species of *Lirceus*, unpigmented and minutely eyed, taken from the bottom of rocks in the riffles of streams in two Arkansas caves.



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A *Lirceus* sp. from Hercules Lookout Cave, Taney County. Unfortunately, specific determinations of *Lirceus* are not possible from existing taxonomic descriptions. Several species of this group probably occur in Missouri.

Suborder Oniscoidea Family Armadillidiidae

Armadillidium nasatum Budde-Lund, TX.

Washington County: Little Scott Cave. This specimen was found in leaf litter near the entrance. It is apparently widespread in the United States, but infrequently found in caves (Muchmore, pers. comm.). Craig (1977) reported this species from a Missouri cave for the first time, but classified it as a troglophile.

Armadillidium vulgare (Latreille), TX.

Barry County: Chimney Rock Cave. **Howell County:** Tabor Cave. **McDonald County:** Long Cave. **Oregon County:** Bat Cave. **Ozark County:** Buzzard Cave and Goat Cave. **Phelps County:** Zorumski Cave. This species was often found in the loose soil, leaves, sticks and excrement of turkey vulture nests and far from cave entrances, in total darkness. Schultz (1970) wrote that this species is one of the most common terrestrial isopods in North America, having been introduced during the time of colonial settlement. He also reported it from Georgia (1970) and Texas caves (1965). The species has been found in Mystery Cave, Perry County, Missouri (Lewis, 1974) and in an Illinois cave (Peck and Lewis, 1978).

Family Ligiidae

Ligidium sp., TP or TX?

Barry County: Chimney Rock Cave. **Carter County:** Spout Spring Annex Cave. **Craw-**

ford County: Bear Cave. **Oregon County:** Bockman Spring Cave and Mine Hollow Cave. **St. Louis County:** Moss Pit Cave, Overhang Cave and Woods Cave. **Shannon County:** Blair Creek Cave and Jam Up Cave. Species cannot be determined because of taxonomic uncertainty (Lewis and Muchmore, pers. comm.). *Ligidium* are common in a number of Illinois and Indiana caves (Lewis, pers. comm.). *Ligidium* actually prefer water more than most other inland terrestrial isopods, being found usually in wet sites near water (e.g., pond, stream, spring, seep, etc.) (Muchmore, pers. comm.). Craig (1977) said *Ligidium* were commonly found in the entrance and twilight zones of Bear Cave, Crawford County.

Family Porcellionidae

Cylisticus convexus (DeGeer), TP.

Carter County: Turley Cave. **Dent County:** Gray Branch Cave. **Hickory County:** Stovepipe Cave. **Howell County:** Hay Holler Cave and Tabor Cave. **Oregon County:** Corbet Cave. **Phelps County:** Lane Cave. **Pulaski County:** Great Spirit Cave, Little Cave and Peninsula Cave. **St. Louis County:** Cobbs Cave (Mine), Moss Pit Cave, Rockwoods Cave and Woods Cave. **Shannon County:** Keyhole Cave. **Washington County:** Great Scott Cave. This species is apparently attracted to animal scats, from which it was collected on several occasions.

This species is an exotic epigeal form, introduced from Europe and now widespread throughout the eastern United States (Muchmore, pers. comm.). It is known from caves in Illinois, Georgia, Texas, Virginia, Indiana, Kentucky and Tennessee (Peck and Lewis, 1978; Schultz, 1965, 1970). This is the first record of this species from Missouri caves.

Porcellio sp., TX or AC?

Phelps County: Zorumski Cave. This determination was based on a single juvenile specimen.

Metoponorthus pruinosis (Brandt), AC.

Dent County: Unnamed Shelter Cave. **St. Louis County:** Rockwoods Cave. These records represent the first account of this species from caves. This exotic species was imported from Europe, and occurs in caves only accidentally, if they happen to be near some center of population (Muchmore, pers. comm.). Apparently there is some disagreement whether the genus should be called *Metoponorthus* or *Porcellionides* (Muchmore, pers. comm.).

Family Trichoniscidae

Caucasonethes n. sp., TB.

Carter County: Mosquito Cave and Turley Cave. **Taney County:** Zoo Cave. This undescribed species is a tiny, unpigmented, eyeless, troglobite. Muchmore (pers. comm.) also received specimens from Tom Aley (Tumbling Creek Cave, Taney County, Missouri) several years ago. This species closely resembles *C. nicholasi* Vandel from Columbia Caverns, Dickson County, Tennessee. Other species are known from Tennessee, as well as Virginia, Texas and Oregon (Muchmore, pers. comm.).

Miktoniscus sp., prob. *medcofi* (Van Name), TP.

Crawford County: Narrows Cave and Stair-step Cave. Adult specimens were collected from loose soil in the twilight zone. These records represent the first reported occurrence of *Miktoniscus* in Missouri, although it has been previously recorded from caves in Arkansas (McDaniel and Smith, 1976), Oklahoma (Vandel, 1965), and Illinois (Peck and Lewis, 1978). This species is known from caves and epigean sites in other eastern states (Muchmore, 1957, 1964; Schultz, 1976; Vandel, 1965). Three tiny juveniles were collected along with the adult male and female specimens reported here.

Miktoniscus sp., TP.

Crawford County: Narrows Cave. **Howell County:** Still Spring Cave. This specimen was also a juvenile, but was somewhat larger. This individual was found far from the other specimens collected from this cave, in rotting wood beneath a stone in twilight.

Order Amphipoda

Family Crangonyctidae

Batrurus brachycaudus Hubricht and Mackin, TB.

Boone County: Devils Icebox Cave, Polly's Pot Cave. **Crawford County:** Narrows Cave. **Dent County:** Bounds Branch Cave. **Franklin County:** Fisher Cave and Sheep Cave. **Iron County:** Boulder Cave and Cave Hollow Cave. **Lincoln County:** Creech Cave. **St. Louis County:** Woods Cave. Specimens were collected from riffles and pools of streams, rimstone pools and isolated muddy bottom pools.

The species is apparently common within its range and is known from cave streams, springs and seeps in southwestern Illinois and east central Missouri (Holsinger, 1972; Peck and

Lewis, 1978). The type locality is not a cave, but a walled spring in St. Louis County, Missouri (Hubricht and Mackin, 1940). Additional Missouri records are from the following counties: Boone, Crawford, Franklin, Jefferson, Madison, Miller, Perry, Pike, Ralls, St. Francois, Ste. Genevieve, St. Louis and Texas (Craig, 1977; Hubricht, 1943; Hubricht and Mackin, 1940; Lewis, 1974; Peck and Lewis, 1978). The Iron and Lincoln county records are reported for the first time.

This species is known to occur with *Crangonyx forbesi* in Devils Icebox Cave and Polly's Pot Cave, Boone County, Missouri. Large specimens of *B. brachycaudus* were collected with large *Caecidotea stygia* from Woods Cave, St. Louis County. These two large species were found, side-by-side, beneath stones in the riffle areas of the very small stream running through Woods Cave. This species also occurred with *Stygobromus* n. sp. 2 in Bounds Branch Cave.

Batrurus n. sp. or subsp., TB.

Carter County: Jayco Hole Cave, Norris Cave, Secesh Cave and Spout Spring Cave.

Oregon County: Bluehole Cave. Specimens were collected from drip pools and from a stream in total darkness. Holsinger (pers. comm.) regards this species as a distinct species or subspecies, although it is closely related to *Batrurus mucronatus* (Forbes), an interstitial phreatobite. The species, or subspecies, reported here occurs in seeps and cave pools in south central Missouri and north central Arkansas. This species differs from *B. mucronatus* in being smaller at sexual maturity and possessing medial sternal processes (Holsinger, 1972).

Crangonyx (*Eucrangonyx*) *forbesi* Hubricht and Mackin, TP.

Barry County: Trailside Spring Cave. **Boone County:** Devils Icebox Cave, Polly's Pot Cave, a concrete spring box (near Rockbridge Cave) and Walled Spring. **Callaway County:** Spaghetti Cave. **Camden County:** Moles Cave. **Crawford County:** Bear Cave and Little Crystal Cave. **Franklin County:** Camp Cave, Fisher Cave, Lone Hill Onyx Cave, Lost Cave and Quarry Cave No. 1. **Lincoln County:** Sherwood Forest Cave. **Miller County:** DeGraffenreid Spring Cave. **Oregon County:** Dead Man Cave and Willow Tree Cave. **Pulaski County:** Great Spirit Cave. **Saline County:** Arrow Rock Cave No. 2. **Shannon County:** Blue Spring and Powder Mill Creek Cave. **Warren County:** surface stream. **Washington County:** Great Scott Cave. Specimens were collected from a wide variety of microhabitats, including riffles and pools of

streams, rimstone pools and drip pools in all cave zones, and from surface springs. Thousands of individuals were observed packed together in a small pool in Lone Hill Onyx Cave stream, during January 1980. They were apparently exhibiting reproductive behavior, as has been previously reported for this species (Hubricht and Mackin, 1940). This species occurred with *B. brachycaudus* in Devils Icebox and Polly's Pot caves. The Warren County record was from a surface tributary to Dry Fork Creek, where thousands of individuals were observed.

This large species is apparently common in caves of the Missouri Ozarks, but this account represents a number of new and interesting records for the species (Holsinger, pers. comm.). Partially unpigmented individuals were collected far from the entrance of caves in total darkness. Holsinger (1972) said that the species does not show an appreciable loss of pigment, or eye structure, when it occurs in caves.

The population in the stream at Great Spirit Cave was sampled by Leslie Hubricht in October, 1939 and in June, 1964 by John R. Holsinger. *C. forbesi* is one of three amphipod species collected from this cave. *Stygobromus onondagaensis* (Hubricht and Mackin) was collected from drip pools and *Allocrangonyx hubrichti* Holsinger from the stream (presumably a distance from the entrance).

There exists in the literature a large number of records assignable to this species (Craig, 1977; Holsinger, 1972; Hubricht, 1943; Hubricht and Mackin, 1940; Lewis, 1974; Peck and Lewis, 1978; Reynolds, 1959). The records of Hubricht (1943) and Hubricht and Mackin (1940) from south central and southwestern Missouri, northern Arkansas, and northeastern Oklahoma may represent a closely related, undescribed species (Holsinger, 1972). Bousefield (1958) reported *C. forbesi* as widely distributed in springs and cave streams of the Mississippi drainage basin, from Arkansas north to Illinois.

Crangonyx n. sp. or subsp., near *forbesi* Hubricht and Mackin, TP.

Barry County: Chimney Rock Cave and Small Hillside Spring. **Carter County:** Lower Camp Yarn Cave. **Christian County:** Math Branch Cave. **Oregon County:** Bat Cave, Green Spring Cave, McDowell Cave and Turner Spring Cave. **Ozark County:** Bat Cave and Bat Spring Cave. **Shannon County:** Keyhole Cave. Specimens were collected from riffles and pools of streams, rimstone pools and drip pools. These specimens were similar to other populations from south central and southwestern Missouri, northern Arkansas, and possibly

northeastern Oklahoma (Holsinger, pers. comm.). The specimens differ from *C. forbesi* in several important characteristics and may represent a closely related, undescribed species or subspecies.

It is interesting to note that specimens of *Crangonyx* n. sp. or subsp., and *C. forbesi* were collected from closely occurring caves in Oregon and Shannon counties. The Turner Spring Cave population of *Crangonyx* n. sp. or subsp. lies only 14.4 kilometers down the Eleven Point River from the Dead Man and Willow Tree Caves population of *C. forbesi*. Similarly, the *Crangonyx* n. sp. or subsp. population of Keyhole Cave in Shannon County lies only 17.6 kilometers up the Current River from the Blue Spring and Powder Mill Creek Cave populations of *C. forbesi*. If one looks at this pattern of dispersal, it creates an almost north-south, overlapping zone of distribution. It appears that this overlapping area of populations could provide a unique opportunity to study character displacement and possible speciation. The records of Hubricht (1943) and Hubricht and Mackin (1940) for south central and southwestern counties in Missouri (Dallas, Hickory, Jasper, Laclede, St. Clair, Stone and Texas) can be recorded as this possible new species or subspecies (Holsinger, 1972).

Crangonyx sp., *forbesi* group, TP.

Barry County: Icebox Spring and Mushroom Rock Cave. **Camden County:** Camp Rising Sun Cave. **Miller County:** McDowell Cave. The Mushroom Rock and McDowell caves populations occurred in riffles and pools in total darkness. This species co-occurred with *Stygobromus ozarkensis* (Holsinger) in the riffles of the small stream in Mushroom Rock Cave.

Stygobromus (Stygionectes) alabamensis alabamensis (Stout), TB.

Barry County: Bear Waller Cave, Cave of the Winds, Chimney Rock Cave, Piney Creek Cave and Sugar Silver Cave. **Camden County:** Boat Shelter Cave. **Phelps County:** Tree Root Cave. **Laclede County:** Coffin Cave. **Lawrence County:** Turnback Cave. **Miller County:** Travertine Spring Cave. **Ozark County:** Mud Cave and Onyx Cave. **Phelps County:** Little Piney Cave. **Pulaski County:** Little Cave. **Taney County:** Zoo Cave. This species was encountered with equal frequency in streams and small isolated drip pools. The species is ecologically variable and occupies a variety of macrohabitats (Holsinger, 1972).

The occurrence of one of the specimens from Bear Waller Cave cannot be fully explained. This specimen was collected from beneath moist wood in a dry, sandy bottom stream

bed, with no trace of water to be found. The other two specimens were taken from a small isolated drip pool several meters from the dry stream bed.

This wide-ranging species is known from south central Alabama, westward to east central Mississippi, and northwestward to southwestern Tennessee, then westward across northern Arkansas to eastern Oklahoma and north to central Missouri (Holsinger, 1972). The populations in Lawrence County are apparently at the northwestern edge of the range of the species.

Stygobromus (*Crangonyx*) *onondagaensis* Hubricht and Mackin, TB.

Crawford County: Onondaga Cave. **Franklin County:** Wildcat Cave. **Phelps County:** Tree Root Cave. **Pulaski County:** Great Spirit Cave. **Washington County:** Brazil Pit Cave and Great Scott Cave. Specimens from Great Spirit Cave were observed feeding on bat guano in small rimstone drip pools. This species was sampled from "drip pools" in October, 1939 by Leslie Hubricht (Holsinger, pers. comm.).

Stygobromus onondagaensis was described from cotypes taken from the "Lily Pools" and "Wonder Room" of Onondaga Cave (Hubricht and Mackin, 1940). An intensive search for specimens in these areas during January, 1982, yielded not a single individual. These pools are drained and cleaned yearly to remove coins (primarily pennies) thrown there by "well-wishing" tourists. It is feared this practice has annihilated the cotype location; however, specimens of *S. onondagaensis* were collected from several other localities within the cave (drip pools and a small stream). Although Craig (1975) did not find *S. onondagaensis* with any other macroorganism in drip pools, we have found it occurring with *C. fustis* in drip pools in Onondaga Cave, and with *C. antricola* and an unidentified planarian (prob. *Spalloplana*) in drip pools in Great Spirit Cave.

This small, subterranean species is known primarily from caves in the Ozark Region of south central Missouri (Holsinger, 1972). Hubricht and Mackin (1940) and Hubricht (1943) present many records for Missouri, but some of them represent specimens of several undescribed species of *Stygobromus* (*onondagaensis* group) in this complex from the Missouri Ozark Region (Holsinger, pers. comm.).

Stygobromus n. sp. 1, *onondagaensis* group, TB.

Camden County: River Cave. **Crawford County:** Cathedral Cave. **Franklin County:** Fisher Cave. **Howell County:** Mud Spring Cave. **Iron County:** Boulder Cave and Cave Hollow Cave. **Lawrence County:** Turnback Cave. **Oregon County:** Willow Tree Cave.

Ozark County: Bat Cave. **St. Francois County:** Falling Rock Spring Cave. **Washington County:** Mossy Spring Cave. Specimens were scarce, with collections primarily limited to small, quiet pools in total darkness. This group of specimens was apparently closely related to *S. onondagaensis* and one of several undescribed species in this complex from Missouri (Holsinger, pers. comm.).

Stygobromus n. sp. 2, *onondagaensis* group, TB.

Dent County: Bounds Branch Cave. Specimens were extremely scarce in quiet pools of the small cave stream. This species was found beneath the same stones as *B. brachycaudus* in this cave. These specimens represent one of at least three other undescribed species from this group in Missouri.

Stygobromus n. sp. 3, *onondagaensis* group, TB.

Washington County: Camp Branch Cave. Specimens were collected from beneath rotting wood in pools in total darkness. These specimens were apparently an undescribed species different from the ones collected from small rimstone pools of Mossy Spring Cave, Washington County. This species was one of at least three undescribed species of *Stygobromus* in Missouri caves.

Stygobromus (*Stygonectes*) *ozarkensis* (Holsinger), TB.

Barry County: Chimney Rock Cave, Onyx Cave (Entrance No. 2) and Mushroom Rock Cave. All specimens were collected from beneath stones or pebbles in riffles of cave streams. The species is apparently restricted to cave streams of the southwestern corner of the Ozarks Plateau (Holsinger, 1972).

This species co-occurred with two other amphipoda, *Crangonyx* n. sp or subsp. (near *forbesi*) and *S. a. alabamensis*, in the riffles of the small stream in Chimney Rock Cave. *Stygobromus ozarkensis* also occurred with *Crangonyx* sp. (*forbesi* group) in Mushroom Rock Cave.

Stygobromus ozarkensis is known from caves in Arkansas and Oklahoma (Holsinger, 1972; McDaniel and Smith, 1976), but little is known about reproduction and natural history of the species.

Family Gammaridae

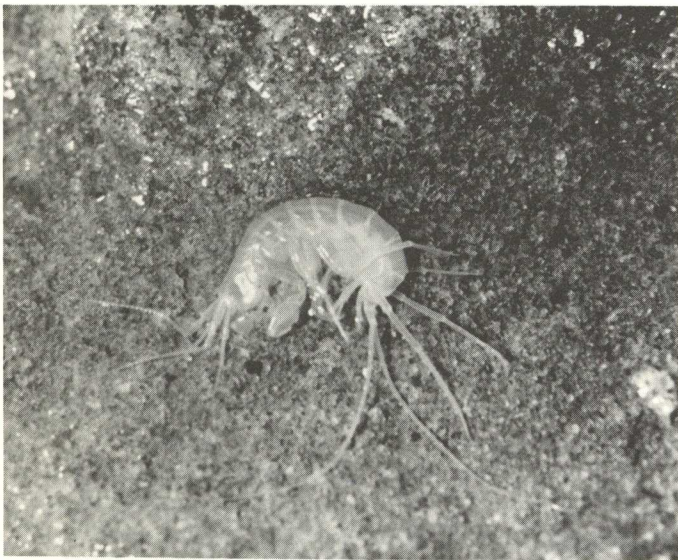
Allocrangonyx hubrichti Holsinger, TB.

Phelps County: Kaintuck Hollow Natural Bridge Cave and Maramec Spring. **Pulaski County:** Killman Cave. **Washington County:** Mossy Spring Cave. Two specimens from Killman Cave were collected from beneath boards in a pool of the stream. The specimens from Mossy Spring Cave and Kaintuck Hollow

Natural Bridge Cave were collected from beneath stones in the streams.

Very little is known about the life history of this species, previously known only from the small streams of two caves in the central Missouri counties of Phelps and Pulaski (Holsinger, 1972). Hubricht's (1943) records of *A. pellucidus* (Mackin) from Saltpeter Cave, Phelps County and Great Spirit Cave in Pulaski County are in error, and are of this species. Holsinger (1971) examined the Great Spirit Cave specimens collected "from stream" by Leslie Hubricht during May, 1942, and described *A. hubrichti*, with a partial redescription of the species. He also believes the species to be quite rare and he would hesitate to remove additional specimens from Great Spirit Cave (Holsinger, pers. comm.). After two separate and exhaustive collecting trips to Great Spirit Cave, efforts have failed to rediscover this species, perhaps indicating a degree of rarity.

The single male specimen from Kaintuck Hollow Natural Bridge Cave exhibited an unusually long third uropod for *A. hubrichti* never before observed by Holsinger (pers. comm.). He further stated that the specimen exhibited the most unique hypermorphic secondary sex characteristic he was familiar with among freshwater subterranean amphipoda.



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Very little is known concerning the life history of *Allocrangonyx hubrichti*. This species is considered rare and is presently known only from four caves in three Missouri counties.

Gammarus minus Say, TP.

Boone County: Conners Cave and Rockbridge Cave. **Franklin County:** Camper Spring. **Stone County:** Mossy Spring Tunnel Cave. **Washington County:** Pipe Spring Cave. Specimens were collected from the slow flowing stream which connects the Rockbridge-Conners cave. The species was extremely

abundant in these two caves, but was apparently not present in Devils Icebox Cave from where the stream emerges. Two other amphipods, *C. forbesi* and *B. brachycaudus* occurred in Devils Icebox Cave.

Gammarus minus is a common species, distributed throughout a large part of the Appalachians, Interior Low Plateaus and the Ozarks (Holsinger, 1972). Hubricht (1943) presented records primarily from springs in Carter, Newton, Pulaski, Ste. Genevieve, Shannon, Stone and Washington counties, Missouri. He also stated that in many Missouri Ozark caves the species occurred in the stream at the mouth of the cave, but not in the caves themselves.

Cole (1970) defines four major geographic types for wide-ranging *G. minus* populations. He stated that the Ozarkian populations included the Ozark Plateau of Arkansas and Missouri, whereas the Post-Kansas population included western Illinois and northeastern Missouri. Cole (1970) also gave the range of the species as Philadelphia and Washington regions, west into the Ozark Plateau.

Smith (1977) reported the species occurred predominantly in riffle areas of an Ozark cave stream in Arkansas, and has observed densities of several hundred square centimeters of *G. minus* in riffle areas during June and July. Smith (1977) and McDaniel and Smith (1976) classified the species as troglone.

One species, *Gammarus elki* Reimer, was described (1969) from Benton County, Arkansas and McDonald County, Missouri. This species, along with *G. propinquus* Hay and *G. purpurascens* Hay are considered synonyms by Holsinger (1972). The old generic name, *Rivulogammarus*, used by Bousefield (1958) is no longer appropriate.

Gammarus pseudolimnaeus (limnaeus) Bousefield, TX.

Oregon County: Cooper Spring Cave and Leech Spring Cave. **Shannon County:** Blue Spring. The single specimen from Blue Spring was collected from the edge of the spring pool, along with specimens of *C. forbesi*.

Hubricht (1943) reported locations for this species under the name *G. limnaeus* S. I. Smith. Missouri records include specimens from Boone, Franklin, Iron, Jefferson, Osage, Madison, Marion, Miller, Pike, Pulaski, Ralls, Reynolds, St. Charles, St. Francois, Ste. Genevieve, St. Louis, Warren and Washington counties (Bousefield, 1958; Hubricht, 1943; and Hubricht and Mackin, 1940). *Gammarus pseudolimnaeus* is rather common in springs and sometimes cave streams in east central Missouri (Holsinger, 1972). It is reported also from caves and springs in Illinois (Peck and Lewis, 1978).

Gammarus sp., poss. *minus/pseudolimnaeus* intergrade, TP or TX?

Franklin County: Sprinkle Spring Cave. These specimens were collected from the sandy bottom stream just inside the entrance. The spring water flowing from the cave mixes with the Meramec River at the point of collection. Holsinger (pers. comm.) said these are "strange looking" specimens, requiring more study.

Gammarus pseudolimnaeus occurred in the same niche with *G. minus* in springs in Arkansas, eastern Missouri, southwestern Illinois, western Kentucky and northwestern Tennessee (Holsinger, 1972). Additional studies are required to determine the degree of intergradation between *G. pseudolimnaeus* and *G. minus*. Sprinkle Spring Cave apparently offers an opportunity for further study.

Gammarus troglophilus (Hubricht and Mackin), TP.

Lincoln County: Creech Cave. **St. Francois County:** Falling Rock Spring Cave. **St. Louis County:** Rockwoods Spring Cave. Specimens were collected from Rockwoods Spring Cave in the slow-flowing stream, on a sandy bottom.

The species is common in cave streams and springs in southwestern Illinois and eastern Missouri (Holsinger, 1972). Reported from cave streams and springs in Franklin, Jefferson, Lincoln, Marion, Perry, Pike, Ralls, Ste. Genevieve and St. Louis counties in Missouri (Bousefield, 1958; Hubricht, 1943; Hubricht and Mackin, 1940; Lewis, 1974; Peck and Lewis, 1978).

Lewis (1974) commonly found the species in stream gravel bars and pools in Mystery Cave, Perry County, and Weise (1953) observed a preference for rock bottom areas in a spring in southern Illinois. Weise (1953) observed the life cycle and ecology of this species in a laboratory.

Order Decapoda

Family Cambaridae

Cambarus (Erebicambarus) hubbsi Creaser, TX.

Oregon County: Greer Spring. **Shannon County:** Jam Up Cave. A small male specimen was collected from beneath a stone in a trickle spring adjacent to the main opening of Greer Spring Cave. The small spring had a sandy substrate with leaves scattered about the bottom.

The type location for this species is Little Creek (a tributary of the St. Francis River), Iron County, Missouri, where the habitat was reported as rocky streams (Hobbs, 1974). Hobbs listed the range as southeastern Missouri and northeastern Arkansas.

Cambarus (Erebicambarus) hubrichti Hobbs, TB.

Oregon County: Cropper Cave, Dead Man Cave, Greer Spring Cave and Trantham Cave.

Phelps County: Maramec Spring and Relfe Spring. **Ripley County:** Panther Cave.

Three individuals were observed in Panther Cave at the edge of an extremely deep lake, where they were seen on decaying detrital materials. Bubbles of methane gas escaped from the detritus when disturbed. Two individuals were observed along with *Typhlichthys subterraneus* (Percopsiformes: Amblyopsidae) in the bat guano covering the sandy bottom of a pool in Dead Man Cave. The *C. hubrichti* observed in Trantham Cave also occurred with *T. subterraneus*, but in a muddy bottom pool in the stream.

By September 29, 1981, the flow of water from Greer Spring Cave had subsided enough to allow entry into the previously water-filled passageways. Two male *C. hubrichti* were observed beneath stones in the rubble bottom of the stream, a distance of approximately 60 meters from the entrance. There was an apparent lack of any organic detritus, and these two individuals were quite small.

The specimen from Relfe Spring was provided by Jerry Vineyard. It was collected in daylight, from just outside one of the many small openings from which this spring flows. Hobbs (pers. comm.) reported that the young male from Relfe Spring (and a juvenile female he had obtained previously from Maramec Spring) exhibited strong spination that does not appear in specimens he has examined from elsewhere within the range of *C. hubrichti*. He further wrote that these specimens from the northern edge of the Missouri range (Phelps County) can be readily distinguished from those collected from other localities to the south by size and other morphological characteristics.

On November 24, 1981 a female (carapace length 28mm) was collected from the edge of the rise pool in Maramec Spring and was carrying 38 young on her pleopods. This was the first record of a *C. hubrichti* female with young. Large numbers of this species were destroyed in Maramec Spring, few of which were carrying eggs. This phenomenon was the result of an ammonium nitrate fertilizer pipeline leaking into the spring's recharge basin. The oxygen content of the spring dropped drastically from a normal level of approximately 8 ppm to less than 0.5 ppm. On November 29, 10 males and 13 females, representing 4 or 5 age classes, were collected from the spring by Jim Dipardo and Tom R. Johnson, and kept alive in holding tanks. They were released into Maramec Spring at a later date, as part of a recovery effort.



James E. Gardner

A female *Cambarus hubrichti* from Maramec Spring, Phelps County, carrying 38 young on her pleopods. This represents the first such record of this species with young. Large numbers of this species, along with other cavernicolous fauna, were destroyed as a result of an ammonium nitrate fertilizer leak into the spring's recharge basin.

Cambarus hubrichti was described by Hobbs (1952) from Lewis Cave, Ripley County, Missouri. Hobbs *et al.* (1977) reported the species to occur in subterranean waters of the White River drainage basin in the Ozark Region of southeastern Missouri. Their county records follow: Carter, Oregon, Phelps, Pulaski, Ripley and Shannon.

Marquart (1979) conducted a survey of the troglobitic crayfish of Missouri. He reported *C. hubrichti* from additional, previously unreported populations in caves in Oregon, Phelps, Pulaski, Shannon and Texas counties, but primarily based his records on sightings from reliable persons. The record for Texas County was reported as being in the collection of Illinois Natural History Survey. Marquart's discussion of species ecology included brief habitat descriptions and some physiochemical water data (e.g., dissolved oxygen, temperature, pH, etc.).

Nordstrom *et al.* (1977) listed *Cambarus hubrichti*, and indicated that this species is rare, or very localized in distribution within Missouri.

C. hubrichti was known only from cave streams of the Eleven Point, Current and Meramec river drainages in Missouri. This species could be more abundant in the Salem Plateau than has been previously reported.

Cambarus (Jugicambarus) setosus Faxon, TB.

Lawrence County: Turnback Cave. This cave apparently has one of the largest populations of *C. setosus* within the range of the species. On August 24, 1981, no less than 20 very large individuals were observed in the stream that flows through the cave. The species was obviously more abundant in the southernmost passageway of the cave where the stream first entered the air-filled passage from a deep siphon. Directly above this emergence is a roosting site for gray bats (*Myotis grisescens*); therefore, a great deal of guano has been introduced into the stream. This section of stream, where the water depth varies from less than 1 to over 2 meters, has a sandy, muddy substrate with some scattered breakdown providing cover. Both males and females were examined, but no specimens were collected.

Hobbs and Barr (1960) reported *C. setosus* from only definitely known localities in south-western Missouri, principally in the James River drainage. They cited caves and a well location for Christian, Greene and Jasper counties, and stated that *C. setosus* was apparently much more abundant in earlier years. Hobbs *et al.* (1977) listed records from caves, springs, and wells in Christian, Dade, Greene and Jasper counties. They suggested their tentative records from Delaware and Mayes counties, Oklahoma, be confirmed by securing first form males from those localities.

The type-locality for *C. setosus* was Wilson's (Whisners) Cave, Jasper County, Missouri (Faxon, 1889). The type-locality for *C. ayersii* (a synonym of *C. setosus*) was Fishers (Sequiota) Cave, Greene County, Missouri (Steele, 1902). It is feared the population in Fishers Cave has been extirpated due to pollution leakage from the Springfield, Missouri, sewage substation (Marquart, 1979).

Marquart (1979) reported several new locality records for *C. setosus* in his survey of the troglobitic crayfish of Missouri. His results presented locality data and short notes on ecology for specimens in caves and springs in the following Missouri counties: Christian, Dade, Greene, Jasper, Lawrence, Newton and Stone. He also reported an unidentified species (*Cambarus [Jugicambarus] sp.*) from Bluff Dwellers Cave, McDonald County, Missouri. Don Jackson and Larry Willis (pers. comm.) possessed a number of observation records for *C. setosus*, including observations made as far back as 1966. Their records, although a number of them were based upon unconfirmed sightings, include caves and springs in Dade, Greene and Stone counties, Missouri. Also mentioned were leads for troglobitic *Cambarus* in caves in Laclede, Wright and McDonald counties.

Nordstrom *et al.* (1977) listed *C. setosus* as endemic to subterranean waters in south-western Missouri. This species has certainly felt the progressive pressures of subterranean water pollution and alteration (if not destruction) of habitats brought about by rapidly expanding urban centers.

Orconectes hylas (Faxon), TX.

Washington County: Camp Branch Cave. A male and a female of this epigean species were collected from beneath a stone in a pool of the small cave stream.

Williams (1954) reported this species from surface streams and rivers in Reynolds, Washington, Iron and Ste. Genevieve counties, Missouri. Hobbs (1974) listed the range as tributaries of Big and Black rivers in southeast

Missouri. This species has not been reported previously from caves.

Orconectes nais (Faxon), TX.

Boone County: Devils Icebox Cave. **Washington County:** Great Scott Cave. The individuals from Great Scott Cave were captured in deep calm pools far from the entrance; however, Hobbs (pers. comm.) doubts these determinations and believes they are *O. virilis* (Hagen).

Orconectes neglectus chaenodactylus Williams, TX.

Douglas County: Still Spring Cave. **Ozark County:** Bat Cave. This subspecies is restricted to the North Fork of White River and its tributaries in Texas, Douglas and Ozark counties in Missouri (Nordstrom *et al.*, 1977). Many individuals were observed in Bat Cave, along with *O. punctimanus* Creaser, feeding on drowned juvenile gray bats in partially guano-filled rimstone pools.

Orconectes neglectus neglectus Faxon, TX.

Christian County: Math Branch Cave. **Taney County:** Dicus Cave. Two very small males were collected from the small stream flowing from Dicus Cave. The cave is several kilometers from any permanent surface stream or pond. *O. n. neglectus* has been previously reported from Missouri caves (Williams, 1954).

Orconectes ozarkae Williams, TX.

Oregon County: Leech Spring Cave. **Shannon County:** Blue Spring Cave. Both of these female specimens were collected during July.

Williams (1954) listed records of hundreds of specimens from surface streams in northern Arkansas counties and eight counties across southern Missouri. Hobbs (1974) reported the range of this species as the White River system in southern Missouri and northern Arkansas. There were no known previous reports of this species from caves.

Orconectes punctimanus Creaser, TX.

Crawford County: Onondaga Cave. **Ozark County:** Bat Cave. **Pulaski County:** Great Spirit Cave. **Shannon County:** Flying-W Cave. **Warren County:** surface stream. **Washington County:** Mossy Spring Cave and Pipe Spring Cave. Five specimens were collected from Bat Cave, where they were actively feeding on drowned juvenile gray bats, in partially guano-filled rimstone pools.

Orconectes sp., TX.

Oregon County: Cooper Spring Cave. **Washington County:** Great Scott Cave and Pipe Spring Cave. These female specimens could not be identified to species.

Class Arachnida

Order Pseudoscorpionida

Family Cheiridiidae

Cheridium firmum Hoff, TX or AC?

Texas County: Unnamed Cave No. 1. This single female specimen was collected from the debris of an eastern wood rat (*Neotoma floridana*) nest, in total darkness. This species was described from Illinois by Hoff (1952).

Family Chernetiidae

Dinocheirus sp., AC.

Phelps County: Pillman Cave. **Texas County:** Unnamed Cave No. 1. The single male specimen from the unnamed cave was collected from fresh, green animal scat in total darkness. Five specimens from Pillman Cave were collected in eastern wood rat (*Neotoma floridana*) feces and nesting materials near the entrance.

Hoff and Bolsterli (1956) reported *D. venustus* Hoff and Clawson from an epigeal site in Iron County, Missouri. They stated that *D. venustus* was previously known only from the type locality, a eastern wood rat (*Neotoma*) nest in Lawrence, Kansas.

The specimen from the unnamed cave and four of the five specimens from Pillman Cave were males. Muchmore (pers. comm.) stated that the single female from Pillman Cave will be mounted and studied, and should furnish some additional information about the genus.

Hesperochernes occidentalis Hoff and Bolsterli, TX or AC?

Carter County: Blue Spring Cave. **Dent County:** Bounds Branch Cave. **Franklin County:** Hidden Room Cave. **Madison County:** Marsh Creek Cave No. 2. **Oregon County:** Bluehole Cave and Everette Chaney Cave. **Pulaski County:** Killman Cave and Wilson Cave No. 1. Specimens were collected most often in association with bat guano and animal droppings in total darkness. Muchmore (pers. comm.) stated that *Hesperochernes* are usually found on guano in bat caves, where they may have been carried from cave to cave on bats, or on the legs of some larger flies. It is interesting to note that, although we investigated many guano piles in many caves, specimens were collected from bat guano in only three caves. Other specimens were collected from leaves, sticks and soil. *Hesperochernes* were collected from fecal piles throughout Maze Cave, Dade County, Missouri (Pembleton and Bake, 1967) and from bat guano in an Arkansas cave (Youngsteadt and Youngsteadt, 1978).

Apparently these specimens fit the description of type materials from Arkansas caves reported by Hoff and Bolsterli (1956). They stated that the two closely related species, *H. occidentalis* and *H. mirabilis*, are cave-inhabiting forms. *H. occidentalis* was originally described by Hoff and Bolsterli (1956) as *Pseudozoana occidentalis*.

Hesperochernes sp., prob. *occidentalis* Hoff and Bolsterli, TP or TX?

Barry County: Sweet Potato Cave. **Camden County:** Onyx Mine Cave. **Carter County:** Cat Track Cave and Cradle Hollow Cave. **Christian County:** Peter Hollow Cave. **Crawford County:** Moonshine Cave. **Hickory County:** Siphon Cave. **Howell County:** Spring Creek Cave. **Oregon County:** Bat Cave and Corbet Cave. **Ozark County:** Bear Mountain Cave and Potato Cave. **Phelps County:** Apple Dumpling Cave, Garco Cave, Lane Cave, Phelps Cave, Rogers Cave and Zorumski Cave. **Pulaski County:** Little Cave. **Shannon County:** Davis Cave. **Taney County:** Marholtz Cave and Zoo Cave. **Texas County:** FS Cave 130, Unnamed Cave No. 2 and Unnamed Cave No. 11. Specimens were collected in a variety of macrohabitats, but were found most often associated with loose, dry soil and leaf debris. They were most often found beneath structures such as stones, sticks, etc., in all cave zones.

A large female with ten eggs attached was collected from loose soil, beneath rotting wood and leaf debris in December. Nymphs were present in collections from other study caves during March, April and December. A large individual was collected from beneath a stone in loose soil and was clasping a fungus gnat (Diptera: Mycetophilidae) in its chela.

Four females and two nymphs were collected from beneath the remains of a dead opossum (*Didelphis virginiana*) in total darkness.

Missouri *Hesperochernes* represent a diversified, somewhat variable, group of cavernicoles poorly known taxonomically. Although apparently quite common and widespread in caves in the Missouri Ozarks, very little is known about their natural history.

Hesperochernes n. sp., TP.

Texas County: FS Cave 135. These specimens were found in loose, dry soil in the debris of a wood rat nest in twilight. Muchmore (pers. comm.) reported that these specimens may belong to *Hesperochernes*, but are quite different from other specimens, and indeed different from any *Hesperochernes* he has ever seen. He further stated that the specimens were certainly cave adapted in having attenuated

palps, but the chelae were large and angular. A female from FS Cave 135 may provide a more specific identification of this species.

prob. *Hesperochernes* sp., TP or TX?

Camden County: Gar Cave. **Carter County:** Buzzard Cave. **Oregon County:** Three Entrance Cave. Muchmore (pers. comm.) stated that these specimens were noticeably different from specimens collected in Texas County Cave FS 135, and may represent a different genus. He further stated that a female in these collections should make determinations more definite.

Family Chthoniidae

Apochthonius sp., TP.

Barry County: Buck Ridge Cave and Chimney Rock Cave. **Camden County:** River Cave. **Taney County:** Zoo Cave. A female and an immature specimen were collected from moist rotting wood in total darkness, from Buck Ridge Cave. The male specimens from Chimney Rock Cave and River Cave were collected from rotting wood in total darkness. The females from Zoo Cave were found beneath a rotting skull of a field mouse (*Peromyscus* sp.). The *Apochthonius* from Barry and Taney counties possessed only a single pair of eyes instead of the normal configuration of four eyes found in epigeal species. The specimen from River Cave was strikingly cave adapted, being eyeless and attenuated (Muchmore, pers. comm.). Muchmore further stated that there are a number of cave-adapted species in the Ozarks.

Troglobitic tendencies (especially the reduction of eyes and eye structures) have been shown repeatedly for Pseudoscorpionida, more especially *Apochthonius* (Benedict and Malcolm, 1973; Muchmore, 1967). Eyeless, cave-adapted forms have been previously reported for Missouri. Muchmore described *A. mysterious* (1976) from Mystery Cave, Perry County, Missouri, and *A. typhlus* (1967) from Old Spanish and Hooten Caves, Stone County, Missouri. *A. colecampi* Muchmore (1967), was described from Cole Camp Cave, Benton County, Missouri, and was somewhat cave adapted. He said although *A. colecampi* has the normal number of four eyes, the larger size and elongated appendages indicate troglomorphic adaptation.

A great deal more study of Missouri *Apochthonius* is needed in order to more fully understand the variability of species and distributions. Craig (1977) reported *Apochthonius* sp., aff. *colecampi*, as a troglophile from Bat Cave, Crawford County and Mushroom Cave, Franklin County, Missouri. These records presented some distributional difficulties, because the type locality for *A. colecampi* lies over 100 miles from these caves (Muchmore, pers. comm.).

Apochthonius sp., TP. or TX?

Christian County: Pole Cave. **Howell County:** Jim Ridge Cave. **Phelps County:** Hanley Cave. **Washington County:** Corral Cave. Specimens were collected from leaves and sticks near the entrances to most caves. The specimen from Pole Cave was found in total darkness and we have strong suspicions it was washed into the cave by the pirated surface stream. These specimens were epigeal forms with the usual number of four eyes.

Most epigeal *Apochthonius* are nameless because they have not been widely collected or carefully studied (Muchmore, pers. comm.). Only *A. noestus* (Banks) has been reported from epigeal sites in Iron and Wayne counties, Missouri (Hoff and Bolsterli, 1956), but the species is probably not correctly identified (Muchmore and Benedict, 1976).

Mundochthonius cavernicolus Muchmore, TB.

Lincoln County: Creech Cave. A single female specimen was collected from feces in total darkness. Muchmore (pers. comm.) identified this species by comparison with type specimens from Saltpeter Cave, and a single specimen from Fogelpole Cave, both in Monroe County, Illinois. He further stated that *M. cavernicolus* are rare in caves.

This account represents the first report of this obligatory cavernicole from Missouri. Some interesting questions could be raised concerning dispersal across the Mississippi River and what variation (if any) exists between the Missouri and Illinois populations.

Order Acarida (Acarina)

Family Ixodidae

Ixodes banksi Bishop, TX or AC?

Oregon County: Turner Spring Cave. **Phelps County:** Phelps Cave. **Texas County:** Unnamed Cave No. 2. A nymph was collected from beneath a stone in loose, dry soil in Phelps Cave in January. Originally suspected of being an undescribed species (Keirans, pers. comm.), this specimen was larger than specimens examined from other locations, and different in certain respects. A female specimen was collected from a stick in very wet sand, and another female was salvaged from a spider web near the entrance to a small cave actively used by beavers (*Castor canadensis*).

Keirans (pers. comm.) said that *I. banksi* is a rather uncommon species most often collected from the beaver. He further stated that it had been collected previously in Alabama, Arkansas, Michigan and Wisconsin. These records are the first account of the species in Missouri.

Two other species, *Ixodes conepti* Cooley and Kohls and *Ixodes cookei* Packard, were collected with *I. banksi* in Phelps Cave, from atop a rock. Phelps Cave contained an unusual abundance of animal scats, namely coyote (*Canis latrans*) and striped skunk (*Mephitis mephitis*). Four bags of dirt and debris from Phelps Cave were sent to Keirans (per his request) for Berlese extraction, but yielded no additional specimens of *I. banksi* (Keirans, pers. comm.).

Ixodes conepti Cooley and Kohls, TX or AC?

Phelps County: Phelps Cave. A male and two females were collected from loose dry soil and sticks in total darkness. *Ixodes conepti* is an uncommon species which has been collected from hognose skunks (*Conepatus* sp.), striped skunks, and the rock squirrel (*Spermophilus variegatus*), according to Keirans (pers. comm.). Keirans further stated that prior to the collection reported here, the species had been collected in Texas and New Mexico.

Phelps Cave contained an enormous amount of animal dung (primarily coyote and striped skunk). Two other species, *Ixodes banksi* and *Ixodes cookei* Packard were collected from near the same location in Phelps Cave. Keirans (pers. comm.) extracted three additional specimens of *I. conepti* from four bags of debris from Phelps Cave.

Ixodes cookei Packard, TX or AC?

Camden County: Gar Cave. **Phelps County:** Phelps Cave. The male specimen from Phelps Cave was collected from atop a stone. Two other species, *Ixodes conepti* and *Ixodes banksi*, were collected from very near the same spot. Large amounts of dung were present throughout the cave (primarily coyote and striped skunk). The male specimen from Gar Cave was collected from beneath a stone in eastern wood rat (*Neotoma floridana*) droppings in total darkness.

Ixodes scapularis Say, TX or AC?

Texas County: Spring Cave No. 32. A single male specimen was found in leaf litter near the stream in the entrance. Keirans (pers. comm.) stated that as adults, *I. scapularis* are on numerous large mammals, while immatures are found on numerous mammals, birds and reptiles.

Ornithodores kelleyi Cooley and Kohls, TX.

Miller County: McDowell Cave. A single

specimen was collected from fresh bat guano in total darkness. Thousands of gray bats (*Myotis grisescens*) were known to utilize McDowell Cave. *Ornithodores kelleyi* is an exclusive bat parasite and is widely distributed across the United States (Keirans, pers. comm.).

Jameson (1959) reported *O. concanensis* Kohls from big brown bats (*Eptesicus fuscus pallidus*) and western big-eared bats (*Plecotus rafinesquii pallescens*) in caves in the southwestern United States. Jameson also found *O. stageri* Cooley and Kohls on the walls and ceiling of a freetail bat (*Tadarida*) cave. There are no known previous reports of *O. kelleyi* from *M. grisescens* in Missouri.

Order Opiliones (Phalangida)

Family Cosmetidae

Vonones ornata (Say), AC.

Boone County: Devils Icebox Cave. **Carter**

County: Cradle Hollow Cave. **Crawford**

County: Onondaga Cave. The specimen from Devils Icebox Cave was collected from the side of a stalagmite below a dome pit, over 1600 meters from the only known entrance.

Peck and Lewis (1978) reported *Vonones* sp. from a cave in southern Illinois. Goodnights (pers. comm.) have found this species in southern Indiana, across the southern United States, and into Texas.

Family Ischyropsalidae

Sabacon cavicolens (Packard), TX.

Oregon County: Turner Spring Cave. This specimen was found on rotting wood in total darkness. This record represents a very interesting, first-time report of this species from Missouri. This species is known to inhabit leaf mold, and is able to survive in any moist protected area, such as offered by cave habitats (Goodnights, pers. comm.).

Shear (1975) and Goodnight (pers. comm.) stated that this species is only occasionally associated with caves. *Sabacon cavicolens* has been reported from Searcy County, Arkansas (Youngsteadt and Youngsteadt, 1978), and *Sabacon* sp. was reported from a southern Illinois cave (Peck and Lewis, 1978). Although *S. cavicolens* is widespread in the eastern United States, much research remains to be done on the ecology, physiology and habits of this species and other cave opiliones (Goodnight and Goodnight, 1960).

Family Phalangiidae

Hadrobunus grandis (Say), TX.

Wright County: Bill Dyer Lead Mine Cave. During July, hundreds of individuals were observed, with two females and a male collected from leaf litter below the entrance.

Leiobunum bicolor (Wood), TX.

Howell County: Tabor Cave. Two females were collected from a large number of individuals on the ceiling just inside the entrance. *Leiobunum* is versatile in feeding habits, consuming bits of organic detritus and preying upon smaller forms (immatures, soft-bodied insects, or larvae) that inhabit caves (Goodnights, pers. comm.). Craig (1975) reported *Leiobunum* sp. as being abundant in the entrance and twilight zones of Green Cave, Washington County, Missouri.

Leiobunum calcar (Wood), TX.

St. Louis County: Overhang Cave and Woods Cave. Hundreds of individuals were observed just inside the entrance to Overhang Cave, and a single male was collected from the wall near the bottom of the pit. A female was collected from leaf litter near the entrance to Woods Cave.

Leiobunum flavum Banks, TX.

Crawford County: Bat Cave, Narrows Cave and Stairstep Cave. **Howell County:** Tabor Cave. **Madison County:** Marsh Creek Cave No. 1. **Pulaski County:** Peninsula Cave. Specimens were collected from the ceiling and floor just inside the entrance to these caves in June, July and August. The specimen from Tabor Cave was collected from a mass of individuals on the ceiling just inside the entrance. *Leiobunum* often congregate in great clumps in dark, moist places, so they are encountered in caves, not far from the entrance (Goodnights, pers. comm.).

Leiobunum sp., poss. *longipes* Weed, TX.

Shannon County: Larkin Ford Cave. This identification was based on an immature specimen collected from the ceiling in twilight.

Leiobunum sp., TX.

Barry County: Deer Leap Cave. **Boone County:** Hog Lot Cave. **Carter County:** Beaver Cave and Cat Track Cave. **Crawford County:** Bat Cave. **Dent County:** Bounds Branch Cave. **Iron County:** Boulder Cave, Cave Hollow Cave Annex, Crooked Creek Cave and Peter Cave No. 2. **Jefferson County:** Heinze Pit Cave. **Miller County:** McDowell Cave. **Oregon County:** Statue Cave. **Pettis County:** Stony Ridge Cave. These specimens, collected in February, May, June and July, were too immature for species determinations.

Mitopus sp., TX.

Texas County: Unnamed Cave No. 1 and Unnamed Cave No. 15. These specimens were identified from immatures collected at the entrance to Unnamed Cave No. 15 and in total darkness in Unnamed Cave No. 1.

Opilio parietinus DeGeer, TX.

Shannon County: Martin Cave and Nill Cave. These forms are highly variable and difficult to identify (Goodnights, pers. comm.).

Family Phalangodidae

Crosbyella spinturnix (Crosby and Bishop), TX.

Howell County: Still Spring Cave. **Texas County:** Unnamed Cave No. 13. Like various *Leiobunum*, *C. spinturnix* feeds on bits of organic detritus and preys on smaller forms of immature or soft-bodied insects that inhabit caves (Goodnights, pers. comm.). Certain populations and races of *Crosbyella* in Arkansas are adapted to cave environments (Goodnight and Goodnight, 1960).

C. spinturnix has been reported from caves in Arkansas and Georgia (Holsinger and Peck, 1971; Youngsteadt and Youngsteadt, 1978) and caves and epigean sites in Alabama, Arkansas, Mississippi and Florida (Goodnight and Goodnight, 1942; Peck, 1970). It is believed these are the first Missouri records.

Erebomaster flavescens Cope, AC.

Christian County: Infant Maze Cave. This specimen was collected from loose soil and leaves near the entrance, where it could have wandered in.

Order Araneae

Family Agelenidae

Agelenopsis emertoni Chamberlin and Ivie, TX.

Howell County: Jim Ridge Cave. This specimen was found in leaf litter near the entrance.

Agelenopsis sp., TX.

Texas County: Hilltop Cave. This juvenile specimen was collected from moist leaves in total darkness.

Cicurina brevis (Emerton), TP or TX?

Crawford County: Stairstep Cave. This specimen had a small web beneath a stone. Bishop and Crosby (1926) reported this species from epigean habitats in North Carolina and Virginia.

Cicurina cavealis Bishop and Crosby, TP.

Barry County: Sweet Potato Cave. **Crawford County:** Cathedral Cave. **Pulaski County:** Kerr Cave. All three females were collected from beneath objects in the twilight and total

darkness zones. Dr. W. J. Gertsch (Reynolds, 1959) said "species of this genus frequently enter caves, but are not in any way restricted to them."

Bishop and Crosby (1926) reported the holotype female from Rocheport (Boone) Cave, Boone County, Missouri, which was first collected and reported as *C. brevis* by Crosby (1905). Bishop and Crosby (1926) observed *C. cavealis* in pocket-like webs on the piles of bat excrement, in Rocheport Cave.

Reynolds (1959) reported *C. cavealis* from Flippin Cave, Elisha Estes Cave and Leugenbiel Cave, Benton County, Missouri. Craig (1977) reported this species from Bat Cave and Jagged Canyon Cave, Crawford County, Missouri. Peck and Lewis (1978) reported *C. cavealis* from a cave in Monroe County, Illinois.

Cicurina minima Chamberlin and Ivie, TP or TX?

Christian County: Rattlesnake Cave. This specimen was collected in wet rotting leaves near the entrance.

Cicurina sp., prob. *arcuata* Keyserling, TP or TX?

Pulaski County: Wilson Cave No. 1. This female was collected from beneath a stone in total darkness.

Cicurina sp., TP or TX?

Barry County: Chimney Rock Cave and Sweet Potato Cave. **Camden County:** Counterfeiters Cave, River Cave and Sassafras Cave.

Carter County: Upper Camp Yarn Cave.

Christian County: Swan Cave. **Crawford**

County: Indian Cave No. 2 and Stairstep

Cave. **Howell County:** Hay Holler Cave.

Laclede County: Coffin Cave and Mayfield

Cave. **Madison County:** Marsh Creek Cave

No. 4. **Phelps County:** Apple Dumpling

Cave, Hanley Cave and Unnamed Cave No. 2.

Pulaski County: Wilson Cave No. 2. **Texas**

County: FS Cave 130, FS Cave 135, Hilltop

Cave, Unnamed Cave No. 14 and Unnamed

Cave No. 15. These specimens were either

hatchlings, or juveniles and could not be identi-

fied to species.

Coras medicinalis (Hentz), TP or TX?

Boone County: Little Dome Cave. **Miller**

County: McDowell Cave and Potato Cave.

Craig (1977) reported *Coras* sp. from three caves in Crawford County, Missouri.

Coras sp. prob. *medicinalis* (Hentz), TP or TX?

Camden County: Camp Hawthorn Cave.

This juvenile specimen was collected from beneath a stone in twilight.

Coras sp., TP or TX?

Barry County: Buck Ridge Cave. **Howell**

County: Hay Holler Cave and Tabor Cave.

These specimens were all juveniles.

Coras sp. or *Coelotes* sp., TP or TX?

Crawford County: Narrows Cave and Stair-

step Cave. **Dent County:** Gray Branch Cave.

Phelps County: Apple Dumpling Cave.

Texas County: Unnamed Cave No. 2.

Wayne County: Eagle Rock Cave. These

specimens were too immature to positively

determine the genus.

Family Amaurobiidae

Callobius bennetti (Blackwell), TX.

Madison County: Marsh Creek Cave No. 1.

This mature female specimen was collected from the wall in twilight.

W. B. Peck (pers. comm.) said this species has never been recorded from this part of the country. He further stated that the nearest records were from Minnesota, and as far south as Chicago, Illinois and Boone County, Iowa.

Callobius sp., prob. *bennetti* (Blackwell), TX.

Madison County: Marsh Creek Cave No. 1.

This juvenile specimen was found beneath a stone in a small web and had just captured a juvenile *Ceuthophilus williamsoni* Hubbell.

Family Araneidae

Cyclosa sp., prob. *turbinata* (Walckenaer), AC.

Texas County: Unnamed Cave No. 15. This specimen was collected from leaf litter near the entrance.

Meta menardii (Latreille), TP.

Camden County: Gar Cave. **Miller Coun-**

ty: McDowell Cave. **Oregon County:** Ever-

ette Chaney Cave. **Texas County:** Unnamed

Cave No. 14, Unnamed Cave No. 14 Annex and

Unnamed Cave No. 15. Specimens were col-

lected from webs on walls and ceilings and from

beneath stones in eastern wood rat (*Neotoma*

floridana) droppings. Specimens were common-

ly collected and observed in total darkness.

Lewis (1974) reported *M. menardii* as common in Spider Pit Cave and other caves in Perry County. The species is widespread in caves and cave-like habitats in the eastern United States (Peck and Lewis, 1978).

Family Clubionidae

Castianeira cingulata (C. L. Koch), TX or AC?

Wright County: Bill Dyer Lead Mine Cave. A male specimen was collected at the bottom of the shallow pit entrance.

Family Erigonidae

Grammonota sp., TX.

Oregon County: Surprise Sinkhole Cave.

Shannon County: Bear Cave. These adult

female specimens could not be identified, be-

cause taxonomic characteristics are based al-

most exclusively on adult males (W. B. Peck, pers. comm.).

prob. *Origanates rostratus* (Emerton), TX or AC?

Wright County: Bill Dyer Lead Mine Cave. This penultimate juvenile male was collected from leaf litter at the bottom of the shallow pit entrance.

Family Leptonetidae

Leptoneta sp., poss. n. sp., TP or TX?

Ozark County: Goat Cave. This single male specimen was found in loose soil and leaves in total darkness.

This possibly undescribed male specimen could conceivably be conspecific with the only other member of Leptonetidae found in caves west of the Appalachians and east of Edwards Plateau in Texas (W. B. Peck, pers. comm.). Peck further stated that a new species of Leptonetidae was described from Blanchard Springs Cave, Stone County, Arkansas, on the basis of two females.

Family Linyphiidae

Centromerus cornupalpis (O. P. Cambridge), TP or TX?

Pulaski County: Peninsula Cave. Specimens were collected from leaf debris at the bottom of the steep sloping entrance. Craig (1977) reported this species from Bear Cave, Crawford County, Missouri.

Centromerus latidens (Emerton), TP.

Boone County: Rockbridge Cave. **Christian County:** Infant Maze Cave. **Franklin County:** Panther Cave. **Jefferson County:** Reiter Cave. **Oregon County:** Turner Spring Cave and Whites Creek Cave. Specimens were collected from the entrance, twilight and total darkness.

Craig (1977) reported *C. latidens* as a troglophile from Bat Cave and Lookout Cave, Crawford County. This species is also known from Pleasant Valley Cave, Jefferson County, Missouri and caves in three Illinois counties (Peck and Lewis, 1978).

Centromerus sp., near *latidens* (Emerton), TP.

Pulaski County: Kerr Cave. Female specimens were collected from eastern wood rat droppings and from rotting sticks, both in total darkness.

Centromerus sp., prob. *latidens* (Emerton), TP.

Madison County: Marsh Creek Cave No. 2. **Oregon County:** Whites Creek Cave. **Pulaski County:** Peninsula Cave. Of these juvenile specimens, only the Madison County specimen was found on bat guano in total darkness.

Centromerus sp., TP.

Madison County: Marsh Creek Cave No. 1 and Marsh Creek Cave No. 2. **Jefferson County:** Reiter Cave. The juvenile males from Reiter Cave were collected from bat guano in total darkness.

prob. *Centromerus* sp., TP.

Christian County: Infant Maze Cave.

Crawford County: Stairstep Cave. **La-**

clede County: Coffin Cave. The pen male specimen from Coffin Cave was collected from bat guano at the bottom of the deep pit entrance.

Eperigone maculata (Banks), TP.

Taney County: Zoo Cave. **Texas County:** Spring Cave No. 32, Unnamed Cave No. 2, Unnamed Cave No. 13 and Unnamed Cave No. 15. Both males and females were collected in April and May from near the entrance and in twilight, respectfully. The Zoo Cave specimen was collected from a white-footed mouse (*Peromyscus* sp.) carcass in total darkness.

prob. *Meineta* sp., TP or TX?

Camden County: Pin Oak Cave and River Cave. **Carter County:** Buzzard Cave and Devils Run Hollow Cave. **Washington County:** Great Scott Cave. These specimens were all females, making identification of species, whose descriptions are based primarily on males, very difficult.

Prolinyphia marginata (C. L. Koch), TP.

Barry County: Bannister Cave, Moonshiner Cave and Shelter Cave. **Camden County:** Robbers Cave. **Texas County:** Unnamed Cave No. 15, Unnamed Cave No. 15 Annex and Unnamed Crawlway Cave. The specimen from Robbers Cave was an adult female collected from a small web on the wall in total darkness. All other specimens were juveniles collected primarily from cave ceilings and walls during March, April and May.

Troglophantes cavernicola (Keyserling), TB.

Barry County: Buck Ridge Cave, Chimney Rock Cave and Moonshiner Cave. **Boone County:** Devils Icebox Cave, Hog Graveyard Cave and Polly's Pot Cave. **Howell County:** Mud Spring Cave. **Lawrence County:** Turnback Cave. **Shannon County:** Powder Mill Creek Cave. Adult males and females were collected during January, February, March and August, with penultimate males and juveniles collected during January, February, March and June. *Troglophantes cavernicola* were found most often associated with decaying organic matter (logs, leaves, sticks and dung) in total darkness.

This blind, troglobitic cavernicole may be placed in the wrong genus, with all the other 55 or more known species being European (W. B. Peck, pers. comm.). *Troglophantes* was first used in 1882 on the basis of vestigial eyes, a taxonomic characteristic that can no longer be considered of generic rank (W. B. Peck, pers. comm.). Peck further stated that taxonomists in Holland and Bulgaria are in positions to make decisions concerning *T. cavernicola* affiliations.

Crosby (1905) reported *T. cavernicola* from Rocheport Cave, Boone County, Missouri. This species is also known from caves in more eastern states (Barr, 1968).

Family Lycosidae

Pardosa sp., TX.

Boone County: Hog Lot Cave. This juvenile specimen was collected from beneath a stone in leaf litter near the entrance, during February.

Pirata spiniger (Simon), TP.

Carter County: Blue Spring Cave. A single specimen was found beneath a stone on the floor in total darkness.

According to W. B. Peck (pers. comm.), this specimen was an exceedingly atypical representative of a common genus. Peck further stated that *P. spiniger* had, heretofore, only been known from Florida and adjoining states, where it was considered rare, until it was discovered that it typically lives in pocket gopher (*Geomys* sp.) burrows. Subsequently, it was found under pine needle mats that were suspended above the ground by wire grass, in another sort of "epi-subterranean" habitat (W. B. Peck, pers. comm.).

Pirata sp., TX?

Carter County: Fern Lip Cave, FS Cave 165 and Jayco Hole Cave. **Franklin County:** Hidden Room Cave. These juvenile specimens were collected most often near the entrance and in twilight.

Schizocosa ocreata (Hentz), TX.

Howell County: Ralph Ridge Pit Cave. **Ozark County:** Bear Cave. These specimens were collected during June and July and were all adult males.

Bishop and Crosby (1926) reported *S. bilineata* Emerton from an epigean site in Columbia, Missouri.

Family Mimetidae

Mimetus puritanus Chamberlin, TX or AC?

Oregon County: Two Entrance Cave. A single female specimen was found in a web on the ceiling near the entrance.

Family Mysmenidae

Mysmena sp., TX or AC?

Camden County: Counterfeiters Cave.

Phelps County: Pillman Cave. These juvenile specimens were found in small webs on the wall in twilight.

W. B. Peck (pers. comm.) said this taxon has been placed in both Theridiidae and Symphytognathidae families, but in recent studies has received its own family.

Family Pholcidae

Pholcus muralicola Maughan and Fitch, TX.

Texas County: FS Cave 135. This male specimen had a small web on the ceiling in total darkness.

Gertsch (via W. B. Peck, pers. comm.) identified this specimen as *P. muralicola*. Gertsch further stated that it was first known from the University of Kansas Natural History Reservation, near Lawrence. He further added that the description of the species by Maughan and Fitch leaves much to be desired. Peck and Lewis (1978) reported a closely related species, *P. phalangoides* Fuesslin, from Hardin County, Illinois.

Pholcus sp., TX.

Texas County: FS Cave 135. Two juvenile specimens were collected from the twilight zone, during May.

Family Pisauridae

Dolomedes tenebrosus Hentz, TX.

Oregon County: Two Entrance Cave. A female was collected from the ceiling in twilight.

Bishop and Crosby (1926) reported *D. tenebrosus* from epigean sites in North Carolina and Virginia. Craig (1977) reported *Dolomedes* (near *tenebrosus*) as a troglaxene from Bat Cave and Jagged Canyon Cave, Crawford County, Missouri.

Dolomedes sp., aff. *tenebrosus* Hentz, TX.

Carter County: Mitchell Hollow Cave. **Phelps County:** Hanley Cave. These juvenile specimens were collected near the entrance to these caves.

Dolomedes sp., aff. *scriptus* Hentz, TX.

Crawford County: Jagged Canyon Cave. This juvenile specimen was collected just inside the entrance.

Dolomedes sp., TX.

Barry County: Eagle Nest Cave, High Hill Pit Cave, Lohmer Cave and Moonshiner Cave.

Boone County: Hog Graveyard Cave, Hog Lot Cave, Little Dome Cave and Rockbridge Cave. **Callaway County:** Spaghetti Cave.

Carter County: Fern Lip Cave and FS Cave

165. **Crawford County:** Bat Cave and Bear Cave. **Franklin County:** Camper Spring Cave and Hidden Room Cave. **Madison County:** Marsh Creek Cave No. 1. **Oregon County:** Bat Cave, Cooper Spring Cave and Willow Tree Cave. **Pulaski County:** Peninsula Cave. **St. Louis County:** Woods Cave. **Washington County:** Camp Branch Cave. **Wright County:** Bill Dyer Lead Mine Cave. These juvenile specimens could not be identified specifically.

Peck and Lewis (1978) reported *Dolomedes* sp. from caves in two Illinois counties.

Family Tetragnathidae

Glenognatha foxi (McCook), TX.

Barry County: Sweet Potato Cave. A female specimen was found beneath a dry piece of stick in twilight.

Family Theridiidae

Achaeranea tepidariorum (C. L. Koch), TP.

Barry County: Moonshiner Cave. **Boone County:** Little Dome Cave and Rockbridge Cave. **Camden County:** Camp Hawthorn Cave, Gar Cave and Island Pit Cave. **Crawford County:** Bat Cave, Bear Cave, Scotia Cave, Switchback Cave and Tube Cave. **Dent County:** Unnamed Shelter Cave. **Franklin County:** Camper Spring Cave. **Jefferson County:** Heinze Pit Cave. **Madison County:** Marsh Creek Cave No. 1. **Miller County:** Buzzards Perch Cave. **Oregon County:** Everette Chaney Cave, Lower Panther Cave and Two Entrance Cave. **Phelps County:** Lane Cave, Pillman Cave and Unnamed Cave No. 2. **Texas County:** FS Cave 135, Unnamed Cave No. 1, Unnamed Cave No. 4, Unnamed Cave No. 14 and Unnamed Cave No. 14 Annex. Specimens were most often collected from small webs on ceilings and walls in total darkness. A juvenile specimen from Lane Cave was collected from a web where it was feeding on a millipede (*Pseudopolydesmus* sp.).

Craig (1977) reported *A. tepidariorum* (Walckenaer) from Stairstep Cave, Crawford County and Green Cave, Washington County. Peck and Lewis (1978) found *A. tepidariorum* in three Illinois caves and classified it as a troglodene.

Achaeranea sp., TP or TX?

Crawford County: Indian Cave No. 2. **Miller County:** McDowell Cave. **St. Louis County:** Rockwoods Cave. Specific determinations could not be made from these juvenile specimens.

Argyrodes trigonum (Hentz), TP or TX?

Crawford County: Indian Cave No. 2. **Texas County:** Unnamed Cave No. 15 Annex. Both a juvenile and an adult female were collected from small webs in total darkness.

Bishop and Crosby (1926) reported *A. trigonum* from North Carolina, Virginia and Alabama.

prob. *Dipoena* sp., TX?

Camden County: River Cave. A female was found in a small web beneath wood in total darkness.

prob. *Steatoda albomaculata* (DeGeer), TX.

Crawford County: Indian Cave No. 2. An adult female was captured from a web on the ceiling in total darkness.

Steatoda sp., TX.

Camden County: River Cave. **Crawford County:** Tube Cave. Juveniles were collected from wet rotting wood and leaves and from the ceiling, both in total darkness.

Peck and Lewis (1978) reported *S. triangularis* from a cave in extreme southern Illinois, and classified the species as accidental.

Family Theridiosomatidae

Theridiosoma argentatum Keyserling, TX or AC?

Pulaski County: Peninsula Cave. A female was discovered beneath leaf litter very near the entrance.

Family Uloboridae

Uloborus glomosus (Walckenaer), TX.

Oregon County: Two Entrance Cave. A female was collected from a web on the ceiling near the entrance, during July.

Class Chilopoda Order Scolopendromorpha

Family Chilenophilidae

Pachymerium ferrugineum (C. L. Koch), AC.

Phelps County: Garco Cave. This specimen was discovered beneath a stone near the entrance, during May.

The species has been reported from Franklin, St. Louis, Jefferson and St. Charles counties, Missouri (Summers, pers. comm.), and from epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

Family Cryptopidae

Cryptops hyalinus Say, AC.

Barry County: Buck Ridge Cave. **Howell County:** Hay Holler Cave. Both specimens were collected from near the entrance to these very small caves.

The species is known from Cole County, Missouri (Summers, pers. comm.), and several epigean sites in Illinois (Summers *et al.*, 1980, 1981).

Scolopocryptops sexspinosus (Say), AC.

Oregon County: Three Entrance Cave. **Ozark County:** Potato Cave. **Pettis County:** Dining Room Cave. **Shannon County:** Blue Spring. **Washington County:** Camp Branch Cave. Specimens were collected from near the entrance to these caves. The specimen from Blue Spring had apparently drowned.

This species has been reported from epigean sites in Jefferson, St. Charles, St. Francois and St. Louis counties, Missouri (Summers, pers. comm.). The species is known from many surface localities in Illinois (Summers *et al.*, 1980, 1981), and is widespread in the southeastern United States (S.B. Peck, pers. comm.).

Theatops spinicaudus (Wood), TX or AC?

Camden County: Pin Oak Cave. **Dent County:** Bounds Branch Spring Cave. **Howell County:** Jim Ridge Cave. **Ozark County:** Goat Cave. **Phelps County:** Garco Cave. Specimens were collected from loose soil and leaves in total darkness and from beneath a stone in twilight. These specimens were collected in May, June and July.

Chamberlin (1928) reported this species from the surface in St. Charles County, Missouri. Summers (pers. comm.) said this species was also known from Franklin, Jefferson, St. Francois and St. Louis counties and St. Louis (city), Missouri. The species is also well known from epigean sites in Illinois (Summers *et al.*, 1980, 1981).

Order Geophilomorpha

Family Dignathodontidae

Strigamia bothriopa Wood, AC.

Washington County: Blacksnake Hole Cave. A specimen was collected from beneath a stone in the entrance.

This species is known from Iron and St. Louis counties, and St. Louis (city), Missouri (Summers, pers. comm.). The species is also known from epigean sites in Illinois (Summers *et al.*, 1980, 1981).

Strigamia branneri (Bollman), AC.

Laclede County: Coffin Cave. **Texas County:** Unnamed Cave No. 2. Specimens were found beneath wood in twilight and in leaf debris below the deep pit entrance to Coffin Cave.

This species was previously known only from St. Charles County, Missouri (Summers, pers. comm.), but is well known from epigean sites in Illinois (Summers *et al.*, 1980, 1981).

Strigamia sp., AC.

Carter County: Mitchell Hollow Cave. **Pulaski County:** Ryden Cave. These specimens were collected from beneath a stone in sandy clay soil and rotting wood.

Family Geophilidae

Arenophilus bipuncticeps (Wood), AC.

Pettis County: Quarry Pit Cave. **Phelps County:** Apple Dumpling Cave. Both specimens were collected during April. The specimen from Quarry Pit Cave could have fallen from inside the concrete building covering the pit entrance.

This species is known from epigean sites in Audrain, Cole, Jefferson, St. Louis and St. Francois counties, Missouri (Summers, pers. comm.). The species is also known from surface localities in Illinois (Summers *et al.*, 1980, 1981).

Geophilus sp., TX or AC?

Barry County: Buck Ridge Cave. This single specimen was collected from wet rotting wood in total darkness.

Chamberlin (1928) described *G. missouriensis* from a single, epigean, holotype specimen, collected in St. Charles County, Missouri. Three species, *G. mordax* Meinert, *G. oweni* (Chamberlin) and *G. vitattus* (Rafinesque), are known from epigean sites in Cole, Crawford, Iron, Jefferson, St. Charles and St. Louis counties, and St. Louis (city), Missouri (Summers, pers. comm.). Summers further stated that *missouriensis* is a synonym of *oweni*.

Craig (1977) reported *G. mordax* as a troglophile or troglaxene from Bear Cave, Crawford County, Missouri. The species *G. ampyx* Crabill, *G. mordax* and *G. vitattus* are known from several epigean sites in Illinois (Summers *et al.*, 1980, 1981).

Order Lithobiomorpha

Family Lithobiidae

Bothropolys multidentatus (Newport), TX.

Barry County: Buck Ridge Cave and Chimney Rock Cave. **Christian County:** Rattlesnake Cave and Swan Cave. **Howell County:** Hay Holler Cave, Ralph Ridge Pit Cave and Willow Branch Cave. **Ozark County:** Goat Cave. **Pulaski County:** Little Cave. **Shannon County:** Powder Mill Creek Cave. **St. Louis County:** Woods Cave. Specimens were collected primarily from loose soil, leaves and wood near the entrances.

Summers (pers. comm.) stated that there is only one ethopolid centipede in the eastern United States, and it was previously placed in the family Ethopodidae. This species is known from Cole, Crawford, Franklin, Jefferson, St. Charles, St. Francois and St. Louis counties, and St. Louis (city), Missouri (Summers, pers. comm.). The species is also well known from Illinois surface environments (Summers *et al.*, 1980, 1981).

Garibius sp., prob. *opicolens* Chamberlin, TX.

Shannon County: Powder Mill Creek Cave. **Washington County:** Great Scott Cave. Specimens were collected from bat guano deep inside Great Scott Cave, during September.

These specimens were originally determined as *G. sp.*, prob. *pagoketes*, but *pagoketes* is synonymous with *opicolens* (Summers, pers. comm.).

If these identifications are correct, these are the first records of this species from Missouri (Summers, pers. comm.). The species, *G. opicolens* is known from epigeal sites in Illinois (Summers, *et al.*, 1980, 1981).

Nadabius ameles (Chamberlin), TP.

Camden County: Fort Cave. **Carter County:** Beaver Cave. One specimen was discovered beneath a stone in twilight and another beneath rotting wood on a mud bank in total darkness.

Peck and Lewis (1978) reported this species as a troglophile from Buddys Cave, Ste. Genevieve County, Missouri. The species is also known from St. Louis County, Missouri (Summers, pers. comm.) and epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

Nadabius iowensis (Meinert), AC.

Pulaski County: Knife Cave. A single specimen was found beneath dung in twilight.

This species has been previously reported from epigeal sites in Crawford, Iron, Jefferson, St. Charles and St. Louis counties, Missouri (Summers, pers. comm.). The species is also

known from epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

prob. *Nadabius* sp., AC.

Barry County: Mushroom Rock Cave. **Carter County:** Beaver Cave. **Phelps County:** Yancy Mills Cave No. 2. During January, a specimen was collected from the ceiling of the dry crawlway in Yancy Mills Cave No. 2, in total darkness. The specimen from Barry County was discovered beneath leaf litter in total darkness. These specimens were immature and did not possess the last pair of legs necessary to make specific determinations (Summers, pers. comm.).

Neolithobius voracior (Chamberlin), AC.

Phelps County: Tree Root Cave and Zorumski Cave. Both specimens were collected from beneath stones near the entrances.

The species is known from surface locations in Cole, Franklin, Iron, Jefferson, Oregon, St. Francois and St. Louis counties, and St. Louis (city), Missouri (Summers, pers. comm.). The species is also reported from epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

Paitobius juvenus (Bollman), AC.

Carter County: Buzzard Cave. This specimen was found beneath wood debris of a turkey vulture (*Cathartes aura*) nest in twilight. This is the first known record of this species from Missouri, but it is known from epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

Sozibius proridens (Bollman), TX or AC?

Washington County: Oure Cave. This specimen was discovered beneath a stone, far from the entrance.

The species has been previously reported from a surface location in St. Louis County, Missouri (Summers, pers. comm.), and is known from epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

Tadabius tivius Chamberlin, AC.

Carter County: Buzzard Cave. One of two Lithobiidae found beneath wood in the debris of a turkey vulture nest in twilight.

This species is known from epigeal sites in Illinois (Summers *et al.*, 1980, 1981).

Tadabius sp., AC.

Carter County: Upper Camp Yarn Cave.

Phelps County: Zorumski Cave. The specimen from Phelps County was collected from dung and the specimen from Carter County in rotting wood, both in twilight.

Undetermined genus and species, AC.

Phelps County: Zorumski Cave. St. Louis County: Moss Pit Cave. These specimens were too immature for specific determinations.

Order Scutiggeromorpha

Family Scutigeridae

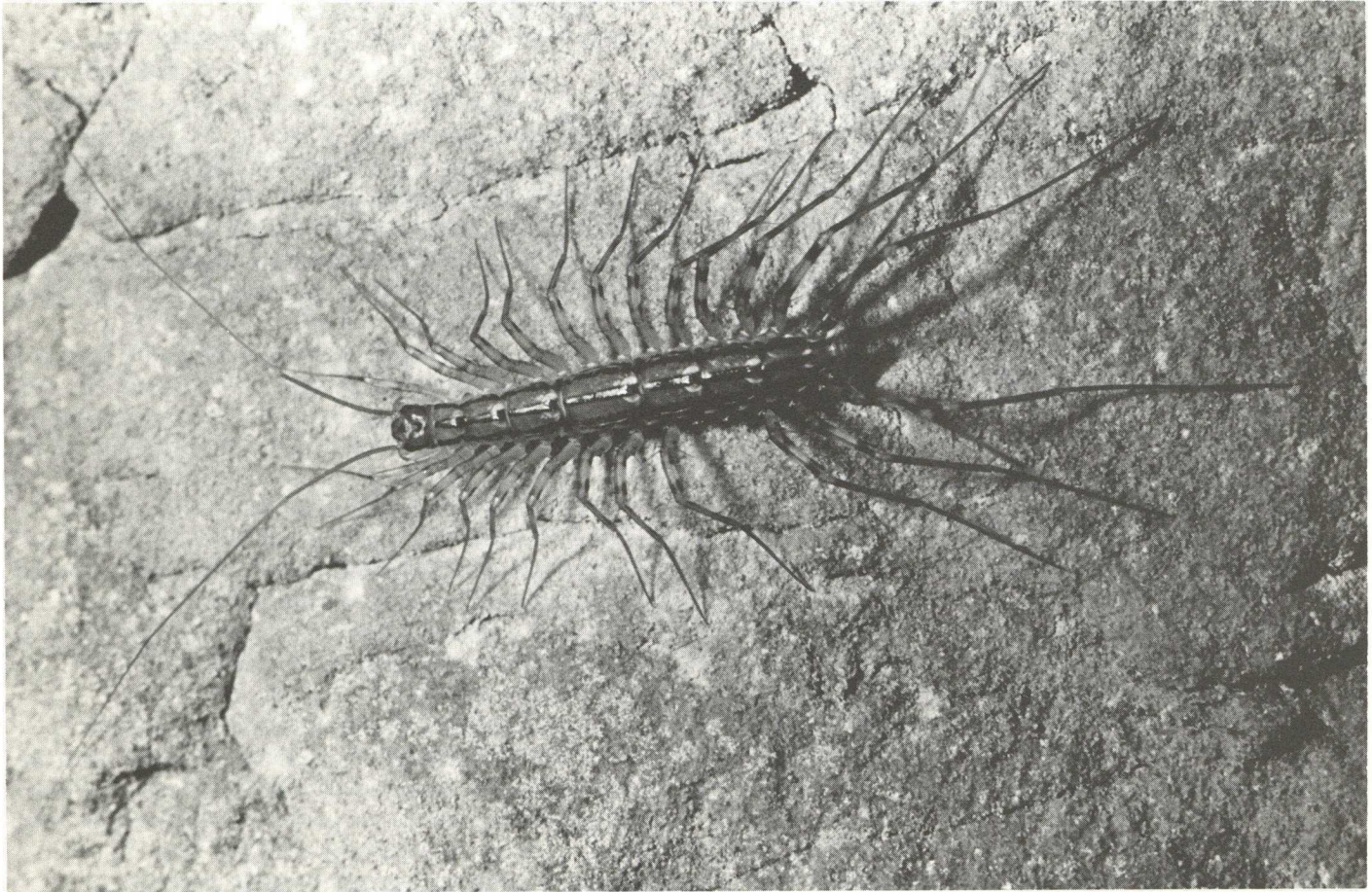
Scutigera coleoptrata (Linnaeus), TX.

Camden County: Fort Cave. **Crawford**

County: Onondaga Cave. **Pettis County:** Dining Room Cave and Stony Ridge Cave.

Phelps County: Pillman Cave. Dozens of individuals were observed just inside the barricaded "Missouri" entrance to Onondaga Cave. Specimens from Pettis County were collected in caves beneath (and connected directly with) a huge stone mansion.

Craig (1977) reported this species from Onondaga Cave, although it is not known where in this large cave it was found. Summers (pers. comm.) said this species was previously reported from St. Louis (city) and St. Louis County, Missouri. Peck and Lewis (1978) reported *Scutigera* sp., prob. *coleoptrata* from two caves in Hardin County, Illinois. Summers et al. (1980, 1981) stated that this species is undoubtedly found in homes and buildings in every part of Illinois, and may be found in areas near human habitation. The species is virtually worldwide in distribution, having been distributed by commerce (S.B. Peck, pers. comm.).



James E. Gardner

Most species of Chilopoda, such as *Scutigera coleoptrata*, are considered accidentals in the cave ecosystem. This species is virtually worldwide in distribution and may indicate some degree of human-induced degradation of cave habitats.

Class Symphyla

Order Undetermined

Family undetermined

Undetermined genus and species, TB?

Franklin County: Camp Cave. **Phelps County:** Hanley Cave and Zorumski Cave. Eyeless, slender and pale specimens were collected from very wet rotting wood and beneath eastern wood rat (*Neotoma floridana*) droppings covered by a fungal growth. The author is not familiar with any previous reports of Symphyla from Missouri caves.

Class Diplopoda

Order Polydesmida

Family Eurymerodesmidae

Eurymerodesmus sp., TX.

Christian County: Infant Maze Cave and Marhud Cave No. 3. **Phelps County:** Gable Spring Cave. **Pulaski County:** Ryden Cave. Specimens were collected during March and April from very near the entrances to these caves.

Family Paradoxosomatidae

Oxidus gracilis (Koch), TP or TX?

Carter County: Buzzard Cave, Fern Lip Cave, Four Hole Cave, FS Cave 165 and Turley Cave. **Crawford County:** Bear Cave and Refuge Cave No. 2. **Lawrence County:** Turnback Cave. **Oregon County:** Bat Cave. **St. Louis County:** Moss Pit Cave and Woods Cave. Males and females were apparently breeding at Woods Cave and Bat Cave during July and August. Thousands of this introduced species were found dead at Fern Lip Cave and Four Hole Cave in mid-September.

The species has been widely distributed by commerce and may be pests in gardens and greenhouses (Shelley, pers. comm.).

Family Platyrrhacidae

Auturus evides (Bollman), TP.

Barry County: Sweet Potato Cave and Buck Ridge Cave. **Camden County:** Pin Oak Cave and River Cave. **Carter County:** Four Hole Cave, Secesh Cave and Spout Spring Annex Cave. **Christian County:** Infant Maze Cave, Marhud Cave No. 3 and Swan Cave. **Crawford County:** Scotia Cave. **Dent County:**

Bounds Branch Cave. **Howell County:** Hay Holler Cave and Willow Branch Cave. **McDonald County:** Long Cave. **Miller County:** Travertine Spring Cave. **Oregon County:** Surprise Sinkhole Cave. **Ozark County:** Bear Mountain Cave and Morrison Knobs Cave. **Pulaski County:** Little Cave. **Shannon County:** Blue Spring and Keyhole Cave. **St. Louis County:** Moss Pit Cave, Overhang Cave and Woods Cave. **Texas County:** Hilltop Cave and Unnamed Cave No. 13. **Washington County:** Rattlesnake Pit Cave. Adult specimens were collected from a wide variety of places within these caves, and throughout all cave zones. Some specimens were juveniles and others were females.

McDaniel and Smith (1976) reported *A. evides* from four caves in three counties in northern Arkansas. They further stated that this species was a troglophile often found in large numbers associated with bat guano. The author never found *A. evides* in large numbers in Missouri caves and never associated with bat guano.

Shelley (1982) revised the genus *Auturus* and stated that *A. evides* has the broadest distribution within the genus, which can be generally described as the Mississippi River basin north of the Arkansas and Ohio Rivers. Shelley reported localities from Minnesota, Wisconsin, Iowa, Illinois, Missouri, Arkansas and Oklahoma and stated that *A. evides* is commonly found in caves in the Ozark Plateau of Missouri. Apparently, *A. evides* is the only cave-associated species of *Auturus* (Shelley, 1982). Excluding the records reported here, he listed the species from primarily epigean sites in the following Missouri counties: Audrain, Boone, Callaway, Cole, Jefferson, Laclede, Moniteau, Morgan, Stone and Wayne.

A. evides has been found throughout the year (except January and July) exclusively on or under damp, rotting logs in an oak-hickory forest in Missouri (Dowdy, 1968).

Family Polydesmidae

Pseudopolydesmus pinetorum (Bollman), TP.

Barry County: Brock Cave. **Carter County:** Spout Spring Annex Cave. **Christian County:** Camp Ridge Cave. **Howell County:** Spring Creek Cave. **Oregon County:** Whites Creek Cave. Specimens were collected from leaves, loose soil and rotting wood near the entrance and in twilight.

Pembleton and Bake (1967) reported *P. pinetorum* from fecal piles and mud banks

adjacent to the stream in Maze Cave, Dade County, Missouri. Aley (1972) listed this millipede from Ozark Underground Laboratory, Taney County, Missouri.

McDaniel and Smith (1976) reported *P. pinetorum* from the twilight zone of three caves in Arkansas, and Youngsteadt and Youngsteadt (1978) reported the species from a cave in Searcy County, Arkansas. Peck and Lewis (1978) reported the species from one cave in extreme southern Illinois.

Pseudopolydesmus sp., TP.

Barry County: Colossal Fault Cave, Moonshine Hole Cave and Radium Cave. **Boone County:** Devils Icebox Cave. **Carter County:** Blue Spring Cave. **Christian County:** Camp Ridge Cave, Pole Cave and Swan Cave. **Franklin County:** Outlaw Cave. **Oregon County:** Surprise Sinkhole Cave. **Phelps County:** Apple Dumpling Cave. **Pulaski County:** Killman Cave and Peninsula Cave. **St. Louis County:** Cobbs Cavern (man-made mine) and Moss Pit Cave. **Texas County:** Hilltop Cave. These specimens were primarily juveniles collected from near the entrance and twilight. The specimen from Devils Icebox Cave was collected from very near bat guano on a mud bank in total darkness.

Craig (1977) reported *Pseudopolydesmus* sp. as a troglone, or troglophile, from Nameless Cave and Onondaga Cave, Crawford County, Missouri. Peck and Lewis (1978) listed records for *Pseudopolydesmus* sp. females and immatures from caves in three Illinois counties.

Family Trichopolydesmidae

Undetermined genus and species, TB.

Christian County: Infant Maze Cave. This juvenile specimen was collected from loose soil and leaves near the entrance.

Peck and Lewis (1978) reported *Antriadesmus* sp. as a troglobite from one cave in Illinois. They further stated that only troglobitic species occur in the genus, and they have observed them in Missouri (Tumbling Creek Cave, Taney County). Hoffman (1979) assigned *Antriadesmus* to a synonymy under *Chaetaspis*.

Family Xystodesmidae

Apheloria corrugata (Wood), TX or AC?

Howell County: Willow Branch Cave. **Oregon County:** Surprise Sinkhole Cave. **Pulaski County:** Peninsula Cave. **Shannon County:** Blue Spring. Specimens were collected from leaves and other organic debris in total darkness and near the entrance. The specimen from Blue Spring had apparently drowned.

Order Chordeumatida

Family Cleidogonidae

Cleidogona sp., TP.

Carter County: Secesh Cave. This specimen was collected from a moist, sandy ledge on the wall in twilight. These records are the first known reports of *Cleidogona* from Missouri caves.

Peck and Lewis (1978) reported *C. unita* Causey from two caves in Illinois.

Tiganogona sp., TP.

Barry County: Buck Ridge Cave, Chimney Cave and Sweet Potato Cave. These specimens were all collected from rotting wood and leaves near the entrance, during March.

Family Conotylidae

Austrotyla specus (Loomis), TP.

Franklin County: Lone Hill Onyx Cave, Mine Cave and Sprinkle Spring Cave. **Phelps County:** Mill Creek Cave. Specimens were collected from very wet rotting wood and animal feces in total darkness.

Hubricht (1950) listed this species under the original combination, *Conotyla specus*, from caves in St. Louis County and Franklin County, Missouri. Causey (1960) reported *C. specus* as a troglophile from Missouri caves. Shear (1969) said *A. specus* is a troglophile of Missouri, Illinois and Iowa, and later (1971) reported it from Michigan, Wisconsin and possibly Minnesota. Lewis (1974) found *A. specus* commonly on mud banks in Mystery Cave, Perry County, Missouri, and from leaf litter extractions from three other Perry County caves. Peck and Lewis (1978) reported finding *A. specus* in the gut of a long-tailed salamander (*Eurycea longicauda*), and reported the species from four caves in Ste. Genevieve County, Missouri.

Family Tingupidae

Tingupa pallida Loomis, TB.

Carter County: Mitchell Hollow Cave, Mosquito Cave, Norris Cave and Turley Cave. **Crawford County:** Bear Cave, Narrows Cave and Scotia Cave. **Dent County:** Bounds Branch Cave. **Oregon County:** Corbet Cave, Surprise Sinkhole Cave and Whites Creek Cave. **Ozark County:** Goat Cave. **Phelps County:** Mill Creek Cave and Phelps Cave. **Pulaski County:** Peninsula Cave and Wolf Den Cave. **Ripley County:** Panther Cave. **Shannon County:** Bear Cave. **St. Louis County:** Moss Pit Cave. **Texas County:** FS Cave 130 and Unnamed Cave No. 15

Annex. **Washington County:** Little Scott Cave. Specimens were most often collected from leaf litter and wet rotting wood in total darkness. Juveniles were collected in July, August and October.

Hubricht (1950) listed *T. pallida* from the Missouri counties of Camden, Crawford, Maries, Wayne, Texas, Miller and Pulaski. Reynolds (1959) found *T. pallida* associated with bat guano in Elisha Estes Cave, Benton County, Missouri. Oesch and Hansen (1960) reported *T. pallida* from Cat Hollow Cave, Dallas County, Missouri. Causey (1960) reported this species from Benton, Boone, Camden, Crawford, Franklin, Maries, Marion, Miller, Jefferson, Phelps, Pulaski, Ripley, Texas and Wayne counties, Missouri. Causey (1960) stated that *T. pallida* is the only cave adapted member of its family and that it was the most widespread troglobitic millipede in Missouri.

Craig (1977) collected this species from Bat Cave, Bear Cave and Jagged Canyon Cave in Crawford County and Hamilton Spring Cave, Washington County. Peck and Lewis (1978) reported *T. pallida* from a cave in Jefferson County, Missouri.

Shear (1981) reported *T. pallida* from caves in two Arkansas counties, collected by the late Dr. Nell B. Causey. Shear (1969) said this species occurred in Illinois. Peck and Lewis (1978) reported *T. pallida* from caves in three Illinois counties.

Family Trichopetalidae

Scoterpes sp., TB.

Barry County: Buck Ridge Cave, Chimney Rock Cave and Sweet Potato Cave. All specimens from these caves were collected during March. Troglobitic Chordeumatida were collected from caves in Barry, Franklin and Jefferson counties, but were unidentifiable to family (Shelley, pers. comm.).

Causey (1960) reported *S. dendropus* Loomis from Stone and Barry counties, Missouri. Marvel Cave, Stone County, is the type location of *S. dendropus*. Shear (1969) stated that *Scoterpes* and *Zygonopus* were the most modified troglobitic genera in North America. He further stated that they are known to occur in many caves in Missouri, Illinois, Kentucky, Tennessee, Alabama and Georgia.

Trichopetalum unicum Cook and Collins, TP.

Christian County: Infant Maze Cave. **Pulaski County:** Ryden Cave. **Ripley County:** Panther Cave. Specimens were found in leaf debris and soil near the entrances. Shear (1969) stated that members of the genus *Trichopetalum* are fragile, and humus dwellers.

This species was previously reported from Missouri (Causey, 1967; Shear, 1972). Causey (1951) reported *T. unicum* from Illinois, Indiana and Arkansas. McDaniel and Smith (1976) reported the species from a single cave in Arkansas, and classified it a troglophile with well developed ocelli.

Order Julida

Family Julidae

Ophiulus pilosus (Newport), AC.

St. Louis County: Moss Pit Cave. Five specimens of this introduced, European species, were collected from leaf litter at the bottom of the pit entrance, where they had apparently fallen.

Family Nemasomatidae

Zosteractis interminata Loomis, TB.

Madison County: Marsh Creek Cave No. 4. This specimen was collected from loose moist soil in twilight.

Causey (1960) first reported this species from caves in St. Louis County and Ste. Genevieve County, Missouri. Shear (1969) reported *Z. interminata* as a monotypic genus known from caves in Missouri and Illinois. Peck and Lewis (1978) found this species in a cave in Pike County, Illinois.

Family Parajulidae

Undetermined genus and species, AC?

Pulaski County: Wilson Cave No. 1. This single specimen was collected from wet rotting hemp rope just above a pool of water in total darkness.

Craig (1977) reported a member of this family, *Ptyoiulus* sp., as accidental, from Look-out Cave, Crawford County, Missouri.

Order Spirobolida

Family Spirobolidae

Narceus americanus (Beauvois), TX.

Barry County: Cliff Notch Cave. **Carter County:** Jayco Hole Cave. **Crawford County:** Jagged Canyon Cave. **Howell County:** Spring Creek Cave. **Madison County:** Marsh Creek Cave No. 1. **Oregon County:** Bockman Spring Cave, Everette Chaney Cave and Turner Spring Cave. **Ozark County:** Bear Mountain Cave. **Shannon County:** Blue

Spring. **Texas County:** Unnamed Cave No. 4, Unnamed Cave No. 14 and Unnamed Cave No. 15. Specimens were collected from entrances, twilight and total darkness. Dozens of individuals were observed in the twilight of Jagged Canyon Cave in October. This species was apparently entering the cave to overwinter there.

McDaniel and Smith (1976) reported this species as an accidental from a single Arkansas cave. Craig (1977) lists *Narceus* sp. from Bear Cave, Crawford County, Missouri, as a troglaxene or accidental. Peck and Lewis (1978) reported this genus from a single Illinois cave and classified it as accidental.

The records presented here seem to indicate *N. americanus* might be more suitably classified as a troglaxene. Specimens were collected from April through December and were found in places within caves where they did not appear to have wandered, fallen or have been washed in.

The Barry County specimen was first determined as *N. annularis* (Rafinesque). Taxonomic characteristics of intermediates have recently led taxonomists to recognize only *N. americanus* as a distinct species (Shelley, pers. comm.).

Order Spirostreptida

Family Cambalidae

Cambala minor Bollman, TP.

Howell County: Jim Ridge Cave. A female specimen was taken from a stone near the cave stream in total darkness, during July.

Hubricht (1950) listed this species from Cellar Cave, Ste. Genevieve County, Missouri. Craig (1977) reported the species from Bear Cave, Crawford County, Missouri. Additional Missouri records for this species are from Lost Cave and Found Cave, Perry County, and Tumbling Creek Cave, Taney County (Shelley, 1979).

McDaniel and Smith (1976) listed the species as a troglophile from a cave in Stone County, Arkansas. Peck and Lewis (1978) reported this species as a troglophile from caves in Hardin, Monroe and Union counties in southern Illinois. Shelley (1979) stated that *C. minor* is a widely occurring troglophilic species in the east-central region of the United States. He reported this species from subterranean and epigeal sites in Virginia, West

Virginia, Kentucky, Ohio, Indiana, Illinois, Missouri, Arkansas, Oklahoma, Tennessee, Alabama, Mississippi and Louisiana.

Known to live and reproduce in subterranean habitats (Shelley, 1979), *C. minor* is also known from several surface habitats near creeks in Arkansas (Causey, 1953). Studies by Shelley (1979) combined the synonyms *C. annulata*, *C. arkansana*, and *C. cara* under this species. *Cambala minor* is the only species of Cambalidae known from Missouri.

Order Callipodida

Family Caspiopetalidae

Abacion tessellatum Rafinesque, AC.

Barry County: Cliff Notch Cave. **Carter County:** Lower Camp Yarn Cave. **Christian County:** Rattlesnake Cave. Specimens were collected from loose soil near the entrance and from the wall and floor in total darkness.

Reynolds (1959) reported *A. creolum* from two caves in Benton County, Missouri. Peck and Lewis (1978) reported *Abacion* sp. as an accidental from two caves in Pike County, Illinois.

Abacion sp., AC.

Barry County: Onyx Cave (Entrance No. 2). **Texas County:** Spring Cave No. 32. A female was collected from leaf litter in the twilight, and another specimen was found on a speleothem in total darkness.

Class Insecta Order Collembola

Family Entomobryidae

Lepidocyrtus cinereus Folsom, AC.

Laclede County: Mayfield Cave. **Texas County:** Unnamed Cave No. 2 and Unnamed Cave No. 15. Specimens were collected from rotting logs in total darkness, and from leaf debris and sticks in twilight. The specimens from Texas County have much more reduced eyes than has been previously recorded for this species (Christiansen, pers. comm.). Christiansen further stated that this species is a surface form, rarely found in caves.

Lepidocyrtus helenae Snider, AC.

Shannon County: Bootlegger Cave. Six specimens were collected from beneath feces in total darkness.

Lepidocyrtus n. sp., AC.

Pettis County: Stony Ridge Cave. This possibly undescribed species was found on wood in the twilight of this small cave.

Lepidocyrtus sp., TX or AC?

Crawford County: Cathedral Cave. **Pulaski County:** Killman Cave. All specimens were collected beneath rotting wood far from the entrances.

Orchesella sp., AC.

Crawford County: Stairstep Cave. This specimen was taken from a spider web in total darkness. This species is a surface form (Christiansen, 1982), which was probably a stray in the cave environment.

This genus is known from a cave in Boone County, Missouri (Christiansen, pers. comm.).

Pseudosinella aera Christiansen, TP.

Crawford County: Bear Cave. **Phelps County:** Apple Dumpling Cave and Rogers Cave. **Texas County:** Unnamed Cave No. 2. Specimens were collected from dung and wood.

Christiansen (pers. comm.) has records of this species from Newton and Dade counties in Missouri. Christiansen (1982) said the species is known from numerous cave and surface localities.

Pseudosinella argentea Folsom, TP.

Boone County: Devils Icebox Cave and Polly's Pot Cave. **Carter County:** Cat Track Cave. **Shannon County:** Branson Cave and Larkin Ford Cave. Specimens were found exclusively in total darkness on bat guano, dung, wood and one specimen from the surface of a rimstone pool.

Christiansen (pers. comm.) has records of this species from caves in Boone, Crawford, Jefferson, Perry, Ripley, Shannon and Taney counties, Missouri. Lewis (1974) collected this species from Mystery Cave, Perry County, Missouri. The species is known from several caves and surface localities (Christiansen, 1982).

Pseudosinella sp., poss. n. sp., *argentea* group, TB.

Crawford County: Scotia Cave. **Dent County:** Unnamed Shelter Cave. **Franklin County:** Wet Hollow Cave. **Oregon County:** Surprise Sinkhole Cave. **Wright County:** Bill Dyer Lead Mine Cave. Individuals were found in leaves and other organic debris primarily from twilight. The specimens from Wet Hollow Cave may be an undescribed species (Christiansen, pers. comm.).

Craig (1977) reported this species as a troglophile from Bear Cave and Jagged Canyon Cave in Crawford County, Missouri. This possibly undescribed group is known from

Mystery Cave, Perry County, Missouri and from caves in two Illinois counties (Peck and Lewis, 1978). There are a number of undescribed species of *Pseudosinella* (Christiansen, 1982).

Pseudosinella espana Christiansen, TB.

Christian County: Moonshine Still Cave. This obligate cave species was found on wet rotting wood in total darkness. Previous to this record, the species was known only from Stone and Newton counties, Missouri (Christiansen, pers. comm.).

Pseudosinella folsomi (Mills), AC.

Camden County: Pin Oak Cave. **Phelps County:** Garco Cave. One specimen was found beneath dung in total darkness and another beneath a stone in the entrance. This is a surface species for which there are no previous cave records (Christiansen, pers. comm.). The species is known from surface locations in Arkansas, Louisiana and Texas (Christiansen, 1982).

Pseudosinella violenta Folsom, TP.

Oregon County: Bockman Spring Cave. **Pettis County:** Quarry Pit Cave. **Pike County:** DuChemin Cave. The specimen from Quarry Pit Cave was found in leaf litter at the bottom of the pit entrance and specimens from DuChemin Cave were collected from rotting wood in twilight. This species is an opportunistic cave form (Christiansen, 1982).

Sinella avita Christiansen, TP.

Washington County: Great Scott Cave. Specimens were collected from pieces of wood in bat guano in total darkness. These collections are the third and fourth records for this species from Missouri (Christiansen, pers. comm.). The other records are from a Jefferson County cave (Christiansen, pers. comm.).

Peck and Lewis (1978) reported this species from one cave in Johnson County, Illinois, and it is known from caves in Kentucky (Christiansen, 1960).

Sinella barri Christiansen, TP.

Jefferson County: Reiter Cave. **Washington County:** Rattlesnake Pit Cave. Dozens of individuals were discovered on rotting wood and bat guano in the total darkness of Reiter Cave. Other specimens were collected from leaf litter, sticks and a decaying terrapin *Terrepene* sp.).

Christiansen (pers. comm.) has records of this species from dung in a cave in Pettis County, Missouri. This species has also been taken from the surface of standing water in a cave in Izard County, Arkansas (McDaniel and Smith, 1976).

Sinella caeca Schott, TP.

Barry County: Cliff Notch Cave. **Crawford County:** Onondaga Cave. **Pettis County:** Stony Ridge Cave. These specimens were collected from an eastern wood rat (*Neotoma floridana*) carcass, dung and on wood in total darkness and twilight.

Other records for this species are from organic debris, wood and dung in caves in Cedar, Crawford and Newton counties, Missouri (Christiansen, pers. comm.). Craig (1977) collected this species from Onondaga Cave, Crawford County.

Sinella cavernarum (Packard), TP.

Washington County: Brazil Pit Cave. Ten specimens were collected from a fungal growth on candle wax in total darkness. Christiansen (pers. comm.) has records from caves in Washington and Franklin counties, Missouri.

Craig (1977) presented records for Hamilton Spring Cave, Washington County, Missouri. This species is known from caves in Hardin, Johnson and Saline counties in Illinois (Peck and Lewis, 1978) and caves in the central eastern United States (Christiansen, 1960).

Family Hypogastruridae

Hypogastrura boletivora Packard, TX or AC?

Boone County: Hog Lot Cave. **Laclede County:** Coffin Cave. Specimens were collected from beneath stones in fresh bat guano in Coffin Cave, where they were associated with *Onychiurus reluctus* Christiansen. Leaf litter in the entrance of Hog Lot Cave yielded only a single specimen. This species is also known from a cave in Phelps County, Missouri (Christiansen, pers. comm.).

Hypogastrura denticulata Bagnell, TP.

Franklin County: Outlaw Cave. Several specimens were collected from dung on a mud floor in total darkness. Other Missouri records include caves in Dade, Franklin, Perry and Phelps counties (Christiansen, unpubl. data).

Craig (1977) listed *Hypogastrura* (*Ceratophysella*) (*denticulata* complex) as a troglophile from Jagged Canyon Cave, Crawford County, Missouri. *Hypogastrura* sp. *denticulata* complex was also reported from Mystery Cave, Perry County, Missouri and from caves in Johnson County, Illinois by Peck and Lewis (1978).

Hypogastrura sp., prob. n. sp., TP.

Madison County: Marsh Creek Cave No. 1 and Marsh Creek Cave No. 2. Only one specimen was collected from bat guano in total darkness of the number two cave, but thousands

of individuals were encountered on bat guano in the number one cave, both during August. As with most new invertebrate species, more materials are needed for study and determination of this probably undescribed species.

Another undescribed species of this genus was taken in Klump and Mertz caves, Perry County, Missouri and reported as a troglophile (Peck and Lewis, 1978).

Family Isotomidae

Folsomia candida Willem, TP.

Carter County: Coalbank Cave. **Crawford County:** Cathedral Cave, Scotia Cave and Stairstep Cave. **Franklin County:** Bear Cave, Fisher Cave and Moores Cave. **Oregon County:** Mine Hollow Cave. **Pulaski County:** Peninsula Cave and Wilson Cave No. 1. **Taney County:** Zoo Cave. This species was collected from a variety of habitats. Specimens were discovered on the surface of small pools, in leaf litter and wood, on fungus, beneath a bat carcass, and beneath a mouse skull, all in total darkness. This species also occurred in leaf debris near the entrance. Thousands of individuals covered a rotting cotton glove in Moore's Cave, whose only entrance is a man-made vertical shaft extending 80 feet below the surface. Rotting, wooden survey stakes did not provide any specimens in Moores Cave.

The species is apparently widespread in Missouri caves where it is known from Barry, Camden, Dade, Newton, Perry, Ripley, Shannon, St. Louis, Stone and Taney counties (Christiansen, pers. comm.). *Folsomia candida* is also reported from Gregg Cave, Ste. Genevieve County (Peck and Lewis, 1978) and Mushroom Cave, Crawford County (Craig, 1977), Missouri.

This species is known from caves in Arkansas (McDaniel and Smith, 1976; Smith 1977; Youngsteadt and Youngsteadt, 1978) and from Illinois caves (Peck and Lewis, 1978).

Isotoma maxillosa Fjellberg, AC.

Laclede County: Coffin Cave. **Lincoln County:** Creech Cave. A single specimen was found on bat guano in the twilight of the deep pit entrance to Coffin Cave. Another specimen was collected from dung in total darkness. This species is probably a surface species (Christiansen, pers. comm.).

Isotoma (Desoria) notabilis Schafer, TP.

Dent County: Gray Branch Cave. **Phelps County:** Hanley Cave. Specimens were collected from wet rotting wood and dung in total darkness. This species is also known from debris and mud in caves in Cedar, Perry and Phelps counties, Missouri (Christiansen, pers. comm.).

The species was reported from Slope and Mystery caves in Perry County, Missouri and a cave in LaSalle County, Illinois (Peck and Lewis, 1978).

Isotoma sp., poss. n. sp., TX.

Pulaski County: Wolf Den Cave. This single specimen collected from leaf debris near the entrance was classified as a troglone by Christiansen (pers. comm.). He further stated that it may be an undescribed species, but more materials are needed for study.

Isotomurus palustroides Folsom, AC.

Texas County: John's Dilemma Cave. This specimen was found beneath dung in twilight. The species is a surface form rarely found in caves (Christiansen, pers. comm.).

Family Onychiuridae

Onychiurus armatus (Tullberg), TP or TX?

Shannon County: Douglas Hollow Cave. This record represents a single specimen collected from wet rotting wood in total darkness.

Onychiurus encarpatus Denis, TP or TX?

Crawford County: Cathedral Cave. Three specimens were collected from beneath rotting wood in total darkness. Other records of this species from caves are from Perry County, Missouri (Christiansen, pers. comm.).

Onychiurus pseudofimetarius Folsom, TP.

Barry County: Sweet Potato Cave. **Christian County:** Infant Maze Cave. **Franklin County:** Lone Hill Onyx Cave. **Phelps County:** Zorumski Cave. **St. Louis County:** Rockwoods Cave. Specimens were collected from leaves, rotting wood and from the surface of calm pools in total darkness. Several specimens were found beneath a dead cricket (*Ceuthophilus* sp.) where it occurred with *O. ramosus* Folsom. Christiansen (pers. comm.) says this species is troglomorphic.

Onychiurus ramosus Folsom, TP.

Christian County: Infant Maze Cave. **Phelps County:** Zorumski Cave. Many specimens were collected from an active turkey vulture (*Cathartes aura*) nest and from a dead cricket (*Ceuthophilus* sp.) in Zorumski Cave.

Onychiurus reluctus Christiansen, TP.

Boone County: Devils Icebox Cave. **Callaway County:** Spaghetti Cave. **Camden County:** Gar Cave. **Carter County:** Cat Track Cave. **Crawford County:** Cathedral Cave and Moonshine Cave. **Franklin County:** Hidden Room Cave, Indian Cave No. 2, Lone Hill Onyx Cave and Outlaw Cave. **Jefferson County:** Reiter Cave. **Laclede County:** Coffin Cave. **Lawrence County:** Turnback Cave. **Lincoln County:** Creech Cave. **Oregon County:** Mine Hollow Cave. **Pettis**

County: Dining Room Cave. **Phelps County:** Gable Spring Cave and Garco Cave. **Pulaski County:** Knife Cave. **Stone County:** Mossy Spring Tunnel Cave. **Washington County:** Brazil Pit Cave, Great Scott Cave, Little Scott Cave and Mossy Spring Cave. Specimens were found on dung, bat guano, wood, leaves, fungus, on the surface of small drip pools and on clay banks, all in total darkness. The species was also discovered in twilight and near the entrance on similar materials. Thousands of this species were observed on very soft and wet dung in Gable Spring Cave. Nine specimens from Mossy Spring Cave were found on and inside the exoskeleton of an unidentified Coleoptera floating on the surface of a small pool.

The only known additional records of this species from caves are from Barry, Camden, Cedar and Jefferson counties, Missouri (Christiansen, pers. comm.) where they were encountered on wood, guano and fungus. This species is widespread and abundant in caves and is rarely found on the surface (Christiansen, 1982).

Onychiurus sp., near *sibericus*, TP or TX?

Washington County: Corral Cave. Eleven specimens were collected from leaves and wood in total darkness.

Onychiurus n. sp. 1, *fimetarius* group, TP?

Crawford County: Onondaga Cave. **Pulaski County:** Killman Cave. Specimens were collected from beneath wood and dung in total darkness. This possibly undescribed species is questionable and requires more materials for determination (Christiansen, pers. comm.).

Onychiurus n. sp. 2, near *pseudofimetarius*, TB?

Shannon County: Bat Cave, Blair Creek Cave, Cave Hollow Cave and Martin Cave. Specimens of this possibly undescribed species were found on wood, leaf debris, on a mud bank and on the surface of a small drip pool. This apparent new species requires more study to make a final determination (Christiansen, pers. comm.).

Family Sminthuridae

Arrhopalites benitus Folsom, AC.

Washington County: Corral Cave. A single specimen was found beneath rotting wood and leaves in total darkness. This species is a common surface form rarely found in caves (Christiansen, 1982).

Arrhopalites clarus Christiansen, TB.

Shannon County: Branson Cave and Martin Cave. Specimens from Branson Cave were collected from loose soil in total darkness, and the ones from Martin Cave from the surface of a drip pool in total darkness.

The species is known to occur in caves in Barry, Perry and Taney counties, Missouri (Christiansen, pers. comm.; Peck and Lewis, 1978) and caves in Arkansas (Christiansen, 1966; McDaniel and Smith, 1976). This species is widespread in the Missouri-Arkansas cave region and is unknown outside of caves (Christiansen, 1982).

Arrhopalites pygmaeus Wankel, TP.

Barry County: Bear Waller Cave. **Camden County:** Ozark Caverns. **Carter County:** Mosquito Cave and Norris Cave. **Christian County:** Pole Cave. **Crawford County:** Sewer Cave. **Franklin County:** Indian Cave No. 2. **Jefferson County:** Reiter Cave. **Lawrence County:** Turnback Cave. **Oregon County:** Bluehole Cave, Mine Hollow Cave and Whites Creek Cave. **Phelps County:** Coon Cave No. 1 and Lane Cave. **Pulaski County:** Kerr Cave, Killman Cave and Wilson Cave No. 1. **Shannon County:** Blair Creek Cave, Bootlegger Cave, Brawley Cave and Round Spring Caverns. **Stone County:** Mosy Spring Tunnel Cave. **Washington County:** Little Scott Cave. **Wright County:** Bill Dyer Lead Mine Cave. Specimens were encountered on wood, leaves, bat guano and the surface of calm pools, in total darkness. Other specimens were found on the ceiling and in organic debris at the entrance and beneath dung in twilight.

Apparently a common widespread troglophile, the species is known from caves in Barry, Boone, Crawford, Franklin, Jefferson, Perry, Phelps, Pulaski, Shannon, Stone, Taney and Washington counties in Missouri (Christiansen, pers. comm.; Craig, 1977; Peck and Lewis, 1978).

The species is also known from two Illinois caves (Peck and Lewis, 1978), two Arkansas caves (McDaniel and Smith, 1976; Youngsteadt and Youngsteadt, 1978), and caves in Tennessee, Virginia and Alabama (Christiansen, 1966). This primarily European species is rare, but widespread in Nearctic surface localities and common and widespread in caves (Christiansen, 1982).

Arrhopalites whitesidei Jacot, TP.

Barry County: Sweet Potato Cave. **Boone County:** Devils Icebox Cave. **Ripley County:** Panther Cave. Specimens were collected from rotting wood, leaf debris, and dung in total darkness and twilight.

Additional Missouri records are from caves in Ripley and Taney counties (Christiansen, pers. comm.). Christiansen (1966) reported this widespread species occurred in caves across the continent, including Wisconsin, Iowa, Alabama, Indiana and Missouri. Peck and Lewis

(1978) reported the species from one cave in Illinois.

Dicyrtoma (Ptenothrix) atra Linnaeus, TX.

Carter County: Coalbank Cave. **Madison County:** Marsh Creek Cave No. 1. Specimens were collected from wood and the surface of a drip pool, both in total darkness.

This species was reported from a cave in Johnson County, Illinois under the name *Ptenothrix atra* (Peck and Lewis, 1978).

Dicyrtoma (Ptenothrix) marmorata Packard, AC.

Crawford County: Onondaga Cave. **Howell County:** Willow Branch Cave. **Texas County:** Unnamed Cave No. 2. Only two specimens were found in rotting wood, leaves, and dung in total darkness, but five specimens were collected from wood and soil in twilight. This species is an epigeal form, rarely found in caves (Christiansen, pers. comm.).

Family Tomoceridae

Tomocerus dubius Christiansen, TP.

Crawford County: Stairstep Cave. **Madison County:** Marsh Creek Cave No. 4. During August, a single specimen was found on the floor and the other in loose soil, both in twilight.

Tomocerus dubius/flavescens intermediate, TP or TX?

Franklin County: Hidden Room Cave and Sheep Cave. **Jefferson County:** Reiter Cave. **Pulaski County:** Kerr Cave. Specimens were found beneath dung, on rotting wood and bat guano in total darkness, and from wood in twilight.

Tomocerus flavescens (Tullberg) were collected from each cave reported here, but no *T. dubius* were found. In Reiter Cave, *Onychiurus reluctus*, *Sinella barri* Christiansen and *T. missus* Mills were collected.

Tomocerus elongatus Maynard, TP.

Pulaski County: Ryden Cave. **St. Louis County:** Moss Pit Cave. **Texas County:** Unnamed Cave No. 15. Specimens were collected only from leaf debris in each cave, below the pit entrances to Ryden and Moss Pit caves and just inside the entrance to Unnamed Cave No. 15. Christiansen (pers. comm.) says this species is troglophilic. Craig (1977) reported this species from Onondaga Cave, Crawford County, Missouri.

Tomocerus flavescens (Tullberg), TP.

Barry County: Deer Leap Cave and Piney Creek Cave. **Camden County:** River Cave. **Carter County:** Beaver Cave, Blue Spring Cave, Cat Track Cave, Four Hole Cave, Jayco Hole Cave, Norris Cave and Spout Spring Cave. **Christian County:** Infant Maze Cave and Swan Cave. **Crawford County:** Nar-

rows Cave and Stairstep Cave. **Dent County:** Bounds Branch Cave. **Franklin County:** Bear Cave, Hidden Room Cave, Panther Cave, Sheep Cave, Sprinkle Spring Cave and Wet Hollow Cave. **Howell County:** Jim Ridge Cave. **Iron County:** Boulder Cave and Crooked Creek Cave. **Jefferson County:** Reiter Cave. **Laclede County:** Mayfield Cave. **Lawrence County:** Turnback Cave. **Lincoln County:** Sherwood Forest Cave. **Madison County:** Marsh Creek Cave No. 1. **Miller County:** DeGraffenreid Spring Cave. **Oregon County:** Bockman Spring Cave, Boulder Canyon Cave, Corbet Cave, Panther Cave, Surprise Sinkhole Cave, Turner Spring Cave, Whites Creek Cave and Willow Tree Cave. **Ozark County:** Goat Cave and Morrison Knobs Cave. **Phelps County:** Hanley Cave and Zorumski Cave. **Pulaski County:** Kerr Cave, Little Cave and Peninsula Cave. **Ripley County:** Panther Cave. **Shannon County:** Bear Cave, Blair Creek Cave, Conglomerate Cave, Douglas Hollow Cave, Hermit Cave, Keyhole Cave, Martin Cave, Powder Mill Creek Cave and Williams Ford Cave. **St. Louis County:** Moss Pit Cave. **Stone County:** Mossy Spring Tunnel Cave. **Texas County:** Barn Hollow Cave, Hilltop Cave, Spring Cave No. 32, Unnamed Cave No. 2, Unnamed Cave No. 13, Unnamed Cave No. 14, Unnamed Cave No. 14 Annex and Unnamed Cave No. 15. **Washington County:** Blacksnake Hole Cave and Great Scott Cave. **Wright County:** Bill Dyer Lead Mine Cave. Specimens were collected from virtually every kind of food item found in the cave, and throughout all cave zones. Large numbers of specimens were observed on single pieces of rotting wood and on dung.

Christiansen (pers. comm.) has additional records of this species from caves in Cass, Perry and Ste. Genevieve counties in Missouri. Reynolds (1959) reported the species from animal scats in caves in Benton County, Missouri. Craig (1977) listed this species from Bat Cave and Onondaga Cave, Crawford County. The species was reported from one cave in Newton County, Arkansas (Youngsteadt and Youngsteadt, 1978) and known to occur in caves in 14 states across the continent (Christiansen, 1964).

Tomocerus lamelliferus Folsom, TP.

Christian County: Infant Maze Cave. **Franklin County:** Wet Hollow Cave. **Oregon County:** Surprise Sinkhole Cave. **Texas County:** Unnamed Cave No. 2. These specimens were collected from leaves, sticks, and loose soil near the entrance and in twilight. Hundreds of individuals were discovered be-

neath a large stone in leaf litter just inside the entrance to Wet Hollow Cave. Although apparently a troglophile (Christiansen, pers. comm.), this species has not been previously reported from Missouri caves. The species is a common surface form, known from only a few, scattered, probably opportunistic, cave localities (Christiansen, 1982).

Tomocerus (Tritomurus) missus Mills, TB.

Boone County: Devils Icebox Cave. **Jefferson County:** Reiter Cave. Specimens were collected from a clay bank in total darkness in Devils Icebox Cave, and from bat guano in Reiter Cave.

This species is known from caves in Jefferson, Perry and Ste. Genevieve counties, Missouri (Christiansen, pers. comm.; Peck and Lewis, 1978) and from caves in two Illinois counties (Peck and Lewis, 1978). Christiansen (1982) says this unique troglobitic species is the most highly troglomorphic of all eastern *Tomocerus* and has no known close relatives in North America.

Order Diplura

Family Campodeidae

Haplocampa n. sp. 1, TB.

Franklin County: Lone Hill Onyx Cave. This specimen, found beneath rotting wood in total darkness, was an immature male and is identical to other specimens from Crawford and Washington counties, Missouri (Ferguson, pers. comm.).

Craig (1977) first reported this genus in Missouri from Bear Cave and Jagged Canyon Cave, Crawford County, and from Green Cave and Hamilton Spring Cave, Washington County. Peck and Lewis (1978) apparently collected the same undescribed species of *Haplocampa* in Illinois Caverns, Monroe County, Illinois. Four new cavernicolous species of the genus *Haplocampa* were reported from California, Idaho and Washington (Ferguson, 1975).

Haplocampa n. sp. 2, TB.

Phelps County: Zorumski Cave. Two female specimens were discovered beneath stones in leaves and sticks of an active turkey vulture (*Cathartes aura*) nest in twilight. This second undescribed species was the first material of its kind from Missouri (Ferguson, pers. comm.).

Haplocampa n. sp. 3, TB.

Ripley County: Panther Cave. Two males and one female were collected from organic

debris on the ceiling, in total darkness. This third undescribed species of troglobitic *Haplocampa* has not been previously collected in Missouri (Ferguson, pers. comm.).

Podocampa n. sp., TP.

Taney County: Zoo Cave. A single male specimen was collected from leaf debris in total darkness. This account represents the first report of this undescribed species from Missouri (Ferguson, pers. comm.).

Podocampa is one of four troglophilic genera known from cave and surface habitats in the United States (Ferguson, 1981).

Podocampa spenceri (Silvestri), TP.

Phelps County: Hanley Cave. Three females were collected from beneath stones in total darkness. Males are needed to be certain that these cave specimens belong to this species (Ferguson, pers. comm.). Ferguson further stated that this species is an endogean (soil inhabitant) previously known from Texas and Louisiana, and their occurrence in caves is probably sporadic.

Order Ephemeroptera

Family Baetidae

Baetis intercalaris McDunnough, AC.

Shannon County: Blue Spring. Nymphs were collected from the edge of the surface rise pool, during July. This is the largest family of mayflies in North America, with nymphs known to occur in a variety of aquatic habitats (Borror and DeLong, 1971).

Family Leptophlebiidae

Leptophlebia austrinus (Traver), AC.

Phelps County: Apple Dumpling Cave. Two nymphs were collected from a small, muddy-bottomed pool near the entrance, during April. The entire family is widely distributed, with nymphs occurring in standing water or in water with reduced current (Borror and DeLong, 1971).

Leptophlebia sp., AC.

Phelps County: Arches Natural Tunnel Cave. Three nymphs were found beneath leaves in a twilight pool.

Order Odonata

Family Corduliidae

Epithea cynosura (Say), AC.

Shannon County: Jam Up Cave. This specimen was collected from beneath a stone in a pool of the stream in total darkness. Jam Up Cave receives large amounts of flood water during heavy rains, and this species was probably washed in.

Order Orthoptera

Family Gryllacrididae

Ceuthophilus gracilipes (Haldeman), TX.

Barry County: Bear Waller Cave, Cave of the Winds, Chimney Rock Cave, Cliff Notch Cave, Currey Cave, High Hill Pit Cave, Last Cave, Moonshiner Cave, Patton Cave and Piney Creek Cave. **Camden County:** Bear Cave No. 1, Camp Hawthorn Cave, Gar Cave, Honey Run Cave, Kings Onyx Cave, Onyx Crawl Cave, Ozark Caverns, Robbers Cave and Sassafras Cave. **Carter County:** Beaver Cave, Buzzard Cave, Mosquito Cave, Turley Cave and Upper Camp Yarn Cave. **Christian County:** Glade Spring Cave and Sanders Cave. **Crawford County:** Little Crystal Cave, Moonshine Cave, Narrows Cave, Stair-step Cave, Switchback Cave and Tube Cave. **Dent County:** Gray Branch Cave. **Howell County:** Ralph Ridge Pit Cave and Tabor Cave. **Iron County:** Boulder Cave, Cave Hollow Cave, Cave Hollow Cave Annex, Crooked Creek Cave, Peter Cave No. 2 and Wasp Cave. **Lawrence County:** Turnback Cave. **Madison County:** Marsh Creek Cave No. 1. **Miller County:** Buzzards Perch Cave, McDowell Cave, Potato Cave and Travertine Spring Cave. **Oregon County:** Big Dome Cave, Boulder Canyon Cave, Cat Cave, Cropper Cave, Statue Cave, Turner Spring Cave, Two Entrance Cave and Wolf Den Cave. **Ozark County:** Cowdry Cave and Goat Cave. **Phelps County:** Apple Dumpling Cave, Coon Cave No. 1, Coon Cave No. 2, Garco Cave, Little Piney Cave, Tree Root Cave, Unnamed Cave No. 2 and Zorumski Cave.

Pulaski County: Kerr Cave, Knife Cave, Little Cave and Wilson Cave No. 1. **Shannon County:** Bat Cave, Branson Cave, Cave Hollow Cave, Conglomerate Cave, Davis Cave, Den Cave, Flying-W Cave, Medlock Cave, Round Spring Cavern, Sycamore Cave and Wind Cave. **Stone County:** Mossy Spring Tunnel Cave. **Texas County:** Barn Hollow Cave, FS Cave 130, FS Cave 135, John's Dilemma Cave, Spring Cave No. 32, Unnamed Cave No. 1, Unnamed Cave No. 2, Unnamed Cave No. 5, Unnamed Cave No. 10, Unnamed Cave No. 13, Unnamed Cave No. 14, Unnamed Cave No. 14 Annex, Unnamed Cave No. 15 and Unnamed Cave No. 15 Annex. **Wright County:** Bill Dyer Lead Mine Cave. A total of 191 specimens from 96 caves are represented in this account. From the total number of specimens collected, exactly equal percentages were collected from the ceiling in total darkness (38%) and twilight (38%). Fifteen specimens (8%) were collected from the ceiling in the entrance. Twenty specimens (11%) were collected from the wall in total darkness and twilight and a single specimen was collected from the wall in one cave entrance. Seasonal variations in this species' location within a cave most certainly exist (Ives, 1964), but these quantitative data, recorded randomly during the years, were insufficient to permit drawing conclusions concerning variation.

Hundreds of individuals were encountered in clusters in ceiling pockets of Unnamed Cave No. 2 and Spring Cave No. 32, in Texas County. The specimens from these clusters, collected during April and May, were all mature females.

Juveniles were found from January through November, and were more numerous after June. Immatures were collected from caves from mid-March through early July, and adults were collected from June through December.

Hubbell (pers. comm.) stated that the species is common and widespread outside of caves in the Ozark Plateau, but is a frequent inhabitant of caves. The records from Camden, Christian, Lawrence, Miller, Shannon and Stone counties presented in this account are new county distribution records for Missouri (Hubbell, pers. comm.)

Oesch and Hansen (1960) reported the species as the only species observed in Cat Hollow Cave, Dallas County, Missouri. Pembleton and Bake (1967) listed the species from Maze Cave, Dade County, Missouri.

The species is widely distributed from Oklahoma to Connecticut (Hubbell, pers. comm.).

Ceuthophilus seclusus Scudder, TX.

Barry County: Moonshiner Cave and Patton

Cave. **Boone County:** Conners Cave, Devils Icebox Cave, Hog Graveyard Cave, Hog Lot Cave, Little Dome Cave, Polly's Pot Cave, Rockbridge Cave and Wasp Shelter Cave.

Callaway County: Spaghetti Cave. **Camden County:** Kings Onyx Cave, Onyx Mine Cave and Sassafras Cave. **Carter County:** Buzzard Cave and Upper Camp Yarn Cave.

Crawford County: Cathedral Cave, Moonshine Cave, Onondaga Cave and Stairstep Cave.

Franklin County: Hidden Room Cave, Mine Cave, Moores Cave, Wet Hollow Cave and Wildcat Cave.

Hickory County: Murphy Cave, Siphon Cave and Stovepipe Cave.

Lincoln County: Creech Cave. **Oregon County:** Two Entrance Cave.

Pettis County: Quarry Pit Cave. **Phelps County:** Zorumski Cave.

Pulaski County: Peninsula Cave. **Shannon County:** Alley Center (a building near Alley Spring), Conglomerate Cave and Secret Cave.

Washington County: Park Cave. From a total of 75 specimens collected from 36 caves and one building, 39 specimens (52%) were taken from the ceiling in total darkness. Thirteen specimens (17%) were taken from the ceiling in twilight and only two from the ceiling in the entrance. Additional specimens were collected from the wall in total darkness (4 total), the wall in twilight (5 total) and one each from dung, clay, rotting wood, and leaves. The specimen from Alley Center was collected inside a building in a closet. This species inhabits dry forests on stony soils, and occasionally enters caves (Hubbell, 1936).

Known to occur through the Central Prairie Plains and Ozark Plateau regions, this species was known from surface locations in Pike, Pulaski, Greene, Stone and Howell counties and from Onondaga Cave, Crawford County, Missouri (Hubbell, 1936). Aley (1972) reported this species as the most common cricket near the entrance to Tumbling Creek Cave, Taney County, Missouri.

Ceuthophilus silvestris Bruner, TX.

Boone County: Devils Icebox Cave. **Camden County:** My Cave. **Dent County:** Bounds Branch Cave.

Franklin County: Quarry Cave No. 1. **Phelps County:** Rogers Cave.

Madison County: Marsh Creek Cave No. 2. **Texas County:** FS Cave 130.

Specimens were collected from the ceiling and floor in twilight, and from the ceiling in total darkness. Other specimens were found beneath a stone, on eastern wood rat (*Neotoma floridana*) droppings, bat guano and other dung in total darkness. Adults were captured during January, March, April and June. Juveniles were captured in August and November. Aley (1972) said this

species was associated with guano piles deep inside Tumbling Creek Cave, Taney County, Missouri. This species is more common outside caves (Hubbell, pers. comm.).

Missouri records include Boone, Franklin, St. Louis, Camden, Phelps, Crawford, St. Francois, Madison, Dent, Texas, Greene, Christian and Taney counties (Hubbell, pers. comm.). Craig (1977) reported the species from Onondaga Cave, Crawford County and Mushroom Cave, Franklin County, Missouri. This species is also known from Oklahoma, Kansas, Nebraska, Arkansas, Illinois, Ohio, Michigan and northeast Ontario (Hubbell, pers. comm.).

Ceuthophilus williamsoni Hubbell, TX.

Barry County: Trailside Spring Cave.

Boone County: Little Dome Cave and Rockbridge Cave. **Camden County:** Island Pit Cave, Kings Onyx Cave and Robbers Cave.

Carter County: Blue Spring Cave, Devils Run Hollow Cave, Four Hole Cave and Jayco Hole Cave. **Crawford County:** Bat Cave, Bear Cave, Stairstep Cave and Tube Cave.

Franklin County: Fisher Cave, Hidden Room Cave, Indian Cave No. 1, Mack Cave, Outlaw Cave, Panther Cave, Sheep Cave and Wet Hollow Cave. **Iron County:** Wasp Cave.

Lincoln County: Sherwood Forest Cave.

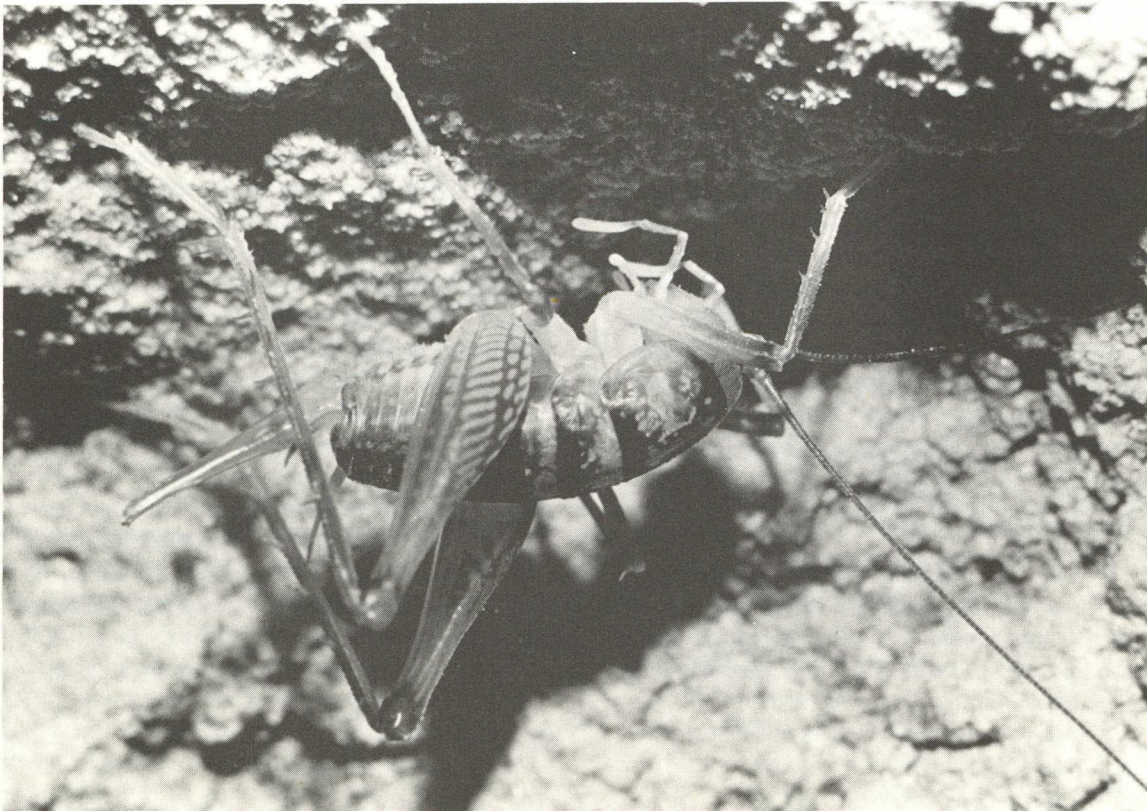
Madison County: Marsh Creek Cave No. 1.

Miller County: McDowell Cave. **Oregon County:** Bat Cave, Bluehole Cave, Lower

Panther Cave, Panther Cave and Turner Spring Cave. **Pike County:** DuChemin Cave. **Saline County:** Arrow Rock Cave No. 1. **Shannon County:** Lower Landing Cave. **Washington County:** Oure Cave. Specimens were collected from caves throughout the year. Of a total of 68 specimens, 39 (57%) were collected from the ceiling in total darkness. Fourteen specimens (21%) were found on the ceiling in twilight. Others were collected from rotting wood and bat guano in total darkness and from leaf litter near the entrance. The specimen from Marsh Creek Cave No. 1 had been captured by a spider (*Callobius* sp., prob. *bennetti*). Clusters of *C. silvestris* were often observed in ceiling pockets.

Reynolds (1959) reported *C. williamsoni* from throughout Cole Camp Cave, Benton County, Missouri. Craig (1977) collected it from Onondaga Cave (type locality), Bat Cave, Lookout Cave, Mud River Cave and Stairstep Cave, Crawford County, Missouri.

This species is known from Iowa, southeastern Minnesota and Illinois (Hubbell, pers. comm.), with the center of distribution apparently in the Ozark Plateau (Hubbell, 1936). Peck and Lewis (1978) reported the species from caves in nine Illinois counties. It is a more common species outside of caves (Hubbell pers. comm.).



Tom R. Johnson

One of four species of Gryllacrididae known from Missouri, *Ceuthophilus williamsoni* has its center of distribution in the Ozark Plateau. The species is much more common outside of caves.

Family Gryllidae

Gryllus sp., AC.

Wright County: Bill Dyer Lead Mine Cave. Very small juveniles were collected from leaf litter in the twilight of the pit entrance.

Nemobius maculatus Blatchley, AC.

Wright County: Bill Dyer Lead Mine Cave. Four juveniles were collected from leaf litter in the twilight of the pit entrance.

Order Coleoptera

Family Alleculidae

Capnochroa fuliginosa (Melsh), TX.

Barry County: Panther Cave. **Howell County:** Spring Creek Cave. **Phelps County:** Hanley Cave. All three larvae were collected from loose soil near the entrance, during December, February and March.

This species is an excavator of such hardwood logs as chestnut (*Castanea* sp.) and maple (*Acer* sp.), and occasionally occurs in vulture (*Cathartes* sp.) nests (Spilman, pers. comm.).

Pseudocistela brevis (Say), TX.

McDonald County: Long Cave. **Ozark County:** Bear Mountain Cave. **Taney County:** Marholtz Cave. Larvae were collected from leaf debris and loose soil near the entrance and in total darkness. The specimens from Marholtz Cave were found in debris of a turkey vulture (*Cathartes aura*) nest.

The larvae of Alleculidae resemble wireworms (Elateridae) and live in rotting wood, plant debris, or fungi (Borror and DeLong, 1971).

Pseudocistela sp., TX.

Camden County: Island Pit Cave and Sasfras Cave. **Carter County:** Four Hole Cave. **Phelps County:** Apple Dumpling Cave and Zorumski Cave. Three larvae from Zorumski Cave were collected from loose soil in an active turkey vulture nest in total darkness. Ten specimens were found in the loose soil beneath eastern wood rat (*Neotoma floridana*) droppings in the total darkness of Apple Dumpling Cave. Additional larvae were collected from leaves and sticks mixed with soil in twilight and near the entrance. Adults of *Pseudocistella* have not been collected from caves.

Undetermined genus and species, TX.

Camden County: Double Opening Cave. **Phelps County:** Garco Cave. **Shannon County:** Medlock Cave. These larvae were

collected from loose soil, leaf debris and sticks in total darkness and in the entrance. Specific identifications were not possible for these larvae.

Family Cantharidae

Cantharis sp., TX.

Howell County: Willow Branch Cave.

Ozark County: Onyx Cave. These two adult specimens were collected from the surface of a small, calm pool and a wall in total darkness during May and June.

Peck (1975) reported the occurrence of *Cantharis* larvae in caves in the east central United States and stated that no adult *Cantharis* had been found in caves. These Missouri records are the first known accounts of adult *Cantharis* in caves. Although adults were found in these two caves, they probably could not survive there, because of adult life stage requirements.

prob. *Cantharis* sp., TX.

Barry County: Chimney Rock Cave.

Boone County: Devils Icebox Cave. **Carter County:** Spout Spring Annex Cave.

Crawford County: Moonshine Cave.

Lawrence County: Turnback Cave. Larvae were collected from beneath a stone in sandy soil near the entrance and from the surface of a pool in total darkness. Additional larvae were collected from beneath the carcass of an eastern wood rat, on a clay bank, and near bat guano, all in total darkness. *Cantharis* sp. larvae have been previously reported from beneath rocks and often near piles of guano or organic debris (Peck, 1975).

Cantharis sp. larvae have been reported from caves in Alabama, Georgia, Illinois, Kentucky, Tennessee and West Virginia, where they may be significant predators in the cave community (Peck, 1975). Reddell (1970) reported a *Cantharis* sp. larva from a single cave in Texas. These Missouri accounts are the first known cave records for the genus in the state.

Podabrus sp., AC.

Crawford County: Sewer Cave. An adult specimen was collected on the floor.

Family Carabidae

Agonum extensicolle Say, AC.

Howell County: Mud Spring Cave. **Ozark County:** Bat Cave. Adult specimens were found on clay banks in twilight.

Lewis (1974) reported this species from Mystery Cave, Perry County, Missouri.

Atranus pubescens Dejean, TP.

Howell County: Mud Spring Cave. **St.**

Louis County: Overhang Cave. **Texas**

County: Unnamed Cave No. 2. Adult specimens were collected from mud banks in total darkness and rotting wood in twilight. These three specimens were collected during June, July and April.

Lewis (1974) reported this species from Mystery Cave, Perry County, Missouri. The species is known from caves in Illinois (Peck and Lewis, 1978), Arkansas (McDaniel and Smith, 1976), and caves in the eastern United States, the Ozarks, and Texas (Barr, 1964).

Bembidion sp., TP.

Boone County: Devils Icebox Cave. **Craw-**

ford County: Bear Cave and Jagged Canyon Cave. **Franklin County:** Sheep Cave.

Lawrence County: Turnback Cave. An adult specimen was collected from the mud bank of Bear Cave, which hundreds of *Trichotichnus vulpeculus* Say (Coleoptera: Carabidae) had colonized. The adult specimens from Jagged Canyon Cave and Devils Icebox Cave were collected from a mud bank in total darkness. Additional specimens were found beneath moist rotting wood and near scattered bat guano, in total darkness.

Lewis (1974) reported a larval *B. texanum* Chaudoir as a troglone from Mystery Cave, Perry County, Missouri. Barr (1964) reported *B. lacunarium* Zimmerman as common in caves in the east, the Ozarks and Texas. McDaniel and Smith (1976) reported *Bembidion* sp. from two Arkansas caves.

Brachinus americanus Dejean, AC.

Boone County: Devils Icebox Cave. An adult specimen was found on the side of a rock below a high dome ceiling in total darkness, during January.

Peck and Lewis (1978) reported *B. fumans* Fabricius as an accidental from Mystery Cave, Perry County, Missouri.

Chalaenius sp., AC.

Jefferson County: Heinze Pit Cave. Fragments of this species were salvaged from a clay bank at the bottom of the pit entrance.

Chalaenius aestivus (Say) was reported as an accidental from a cave in Illinois (Peck and Lewis, 1978).

Cicindela sexguttata Fabricius, AC.

Christian County: Pole Cave. An adult was collected from the edge of a muddy pool in twilight.

Dicaelus dilatatus Say, AC.

Pulaski County: Great Spirit Cave and Ryden Cave. The specimen from Great Spirit Cave was collected from the side of a speleothem in total darkness. The Ryden Cave

specimen was found in moist leaves below the pit entrance.

Craig (1977) reported *D. ambiguus* Laf. as a troglophile from Onondaga Cave, Crawford County, Missouri.

Dicaelus elongatus Bon., AC.

St. Louis County: Moss Pit Cave. An adult specimen was collected from leaf debris below the pit entrance.

Galerita bicolor Drury, AC.

Wright County: Bill Dyer Lead Mine Cave. Two adults were collected from the leaf litter below the shallow pit entrance.

This species has been reported from Mystery Cave, Perry County, Missouri (Lewis, 1974).

Galerita lecontei Dejean, AC.

Howell County: Ralph Ridge Pit Cave. Two adults were found in the moist leaves below the pit entrance, during June.

Loxandrus sp., AC.

Boone County: Hog Lot Cave. An adult was collected from beneath a stone in leaf litter in the entrance.

Pasimachus depressus Fabricius, AC.

Pulaski County: Ryden Cave. An adult was collected from the moist leaves below the pit entrance, in August.

Pasimachus sp., AC.

Jefferson County: Heinze Pit Cave. One adult specimen was collected from a clay bank below the pit entrance.

Patrobus longicornis Say, TX or AC?

Crawford County: Jagged Canyon Cave. An adult was collected from the mud floor in total darkness.

This species has been collected from moist flowstone in Mystery Cave, Perry County, Missouri (Lewis, 1974). Peck and Lewis (1978) reported this species from one cave in Illinois and stated that the species is also known from caves in Alabama and Kentucky.

Platynus tenuicollis (LeConte), TP.

Franklin County: Camp Cave. An adult was found beneath a stone in the entrance.

This species was reported from Mystery Cave, Perry County, Missouri (Lewis, 1974). Craig (1977) reported the species from Bat Cave, Crawford County and Green Cave, Washington County, Missouri. Other Missouri records are from caves in Jefferson, St. Charles and Ste. Genevieve counties (Peck and Lewis, 1978). The species is evidently often found in caves in the eastern United States, the Ozarks and Texas (Barr, 1964).

Platynus sp. 1, AC.

Howell County: Ralph Ridge Pit Cave and Willow Branch Cave. Adults were found in moist leaves in total darkness and below the pit entrance.

Platynus sp. 2, TP.

Christian County: Camp Ridge Cave. **Howell County:** Tabor Cave. **Oregon County:** Bat Cave. **Ozark County:** Bat Cave. **Shannon County:** Bear Cave and Powder Mill Creek Cave. **Taney County:** Hercules Lookout Cave and Zoo Cave. Adult specimens were collected from leaf litter, on mud banks, and from near guano piles. This species of *Platynus* is apparently capable of existing in cave habitats in much the same way as *P. tenuicollis*.

Platynus sp. was reported from Arkansas caves (McDaniel and Smith, 1976; Youngsteadt and Youngsteadt, 1978) where it was found in the twilight zone. *Platynus (Anchomenus) reflexus* Lec. was reported from guano piles and clay in Cat Hollow Cave, Dallas County, Missouri by Oesch and Hansen (1960). Apparently, *P. tenuicollis* is the only species normally and regularly associated with caves.

Platynus sp., TP.

Carter County: Four Hole Cave. **Crawford County:** Stairstep Cave. **Dent County:** Gray Branch Cave. **Franklin County:** Outlaw Cave and Sheep Cave. **Lawrence County:** Turnback Cave. **Pulaski County:** Peninsula Cave. **Texas County:** Unnamed Cave No. 13. Adults were collected from beneath stones, beneath dung, on mud floors, in moist soil and from the wall in all cave zones. These specimens were apparently different from *Platynus* sp. 1 and *Platynus* sp. 2.

Polyderis laevis Say, AC.

Howell County: Willow Branch Cave. This adult specimen was collected from beneath rotting wood, after the cave had flooded previously.

Pterostichus sp., AC.

Pulaski County: Ryden Cave. This specimen was an adult collected from beneath a stone in loose soil near the entrance.

Peck and Lewis (1978) reported *P. (Euferonia) coracinus* Say as an accidental from an Illinois cave.

Stenolophus ochropezus Say, TX or AC?

Howell County: Willow Branch Cave. An adult was collected from wet leaves and sticks in total darkness, after the cave had been flooded by torrential rains.

Peck and Lewis (1978) reported the species as a troglaxene from Klump Cave, Perry County, Missouri.

Trichotichnus vulpeculus Say, TP.

Crawford County: Bear Cave. Two adults were taken from dozens of individuals living in burrows in the mud in the twilight. One excavated burrow measured 85 mm deep, but all appeared to be interconnecting.

Undetermined genus and species, TP, TX or AC?

Barry County: Piney Creek Cave. **Boone County:** Devils Icebox Cave. **Crawford County:** Narrows Cave. **Dent County:** Gray Branch Cave. **Howell County:** Jim Ridge Cave. **Phelps County:** Garco Cave. **Shannon County:** Keyhole Cave, Larkin Ford Cave and Powder Mill Creek Cave. These larvae could not be identified to generic levels. The specimens were collected from beneath dung, beneath a stone, on bat guano and on the floor near water. Unidentifiable fragments of an adult specimen were collected from an area of a clay bank where the insects had constructed small clay cases between a crevice in the floor and the wall. These rounded clay casings (apparently either larvae chambers or pupae cases) were constructed of secreted cave mud and were approximately 1.5 centimeters diameter.

The larvae from Powder Mill Creek Cave differed from those collected in Jim Ridge Cave and Keyhole Cave, and the larvae from Gray Branch Cave, Narrows Cave and Larkin Ford Cave are apparently of the same genus (Anderson, pers. comm.).

Family Chrysomelidae

Chrysomela knabi Brown, AC.

Texas County: Unnamed Cave No. 13. This adult was collected from the wall near a small drip pool in total darkness. There is no published data presently available on the life history of the species (White, pers. comm.).

McDaniel and Smith (1976) reported *Paria juniperi* Blatchley (Coleoptera: Chrysomelidae) from the twilight zone, of an Arkansas cave.

Family Cryptophagidae

Cryptophagus croceus Zimmerman, AC.

Taney County: Scenic Drive Cave. An adult was collected from beneath a stone in the entrance, during June.

Cryptophagus are often found in organic debris and stored food products (Peck, pers. comm.).

Cryptophagus distinguendus Sturm, AC.

Oregon County: Surprise Sinkhole Cave. **Washington County:** Great Scott Cave. An adult was collected from beneath wood below the shallow pit entrance to Surprise

Sinkhole Cave. The specimen from Great Scott Cave was an adult taken from loose soil near bat guano, far from the entrance.

Cryptophagus sp., TX.

Barry County: Lignite Cave. **Pulaski County:** Kerr Cave. Four specimens were collected from beneath dung in the twilight of Lignite Cave. The specimen from Kerr Cave was collected from eastern wood rat droppings in total darkness.

Family Curculionidae

Conotrachelus posticatus Boheman, AC.

Oregon County: Surprise Sinkhole Cave. This adult specimen was collected from leaf litter below the pit entrance.

Lymantes sp., prob. *puteolatum* (Drury), TX or AC?

Barry County: Sweet Potato Cave. The adult specimen reported here was found beneath a dry piece of wood in twilight. Whitehead (pers. comm.) said the genus was extremely scarce in collections, with descriptions of four species and one subspecies, based on 10 specimens. The specimen from Sweet Potato Cave fits the description of *L. putiolatum dietrichi* Sleeper, which was described from Mississippi, but the only Missouri cave specimen associated with caves was *L. sandersoni* Sleeper (Whitehead, pers. comm.).

Family Dytiscidae

Agabus amplus Fall, TP.

Callaway County: Spaghetti Cave. **Camden County:** Pin Oak Cave. **Carter County:** Fern Lip Cave, FS Cave 165 and Turley Cave. **Howell County:** Mud Spring Cave. **Pulaski County:** Great Spirit Cave. **Texas County:** John's Dilemma Cave. Specimens were collected from pools of cave streams, both swimming freely and beneath stones. The species was found most often in twilight during September, but was collected in total darkness during February and May. The larval specimen collected from Spaghetti Cave during February is likely of this species. This species may be an important predator in aquatic habitats in some caves.

Agabus sp., TP.

Callaway County: Spaghetti Cave. **Shannon County:** Keyhole Cave. The female specimen from Keyhole Cave could not be identified specifically, because taxonomic characteristics are based on males. The larval specimen from Spaghetti Cave was collected with an adult *A. amplus*, and is believed to be of that species.

Hydroporus vilis LeConte, TP.

Pulaski County: Little Cave. Three adult specimens were collected from beneath moist

dung on a dirt bank. Normally an aquatic inhabitant, they are known to leave the water at night and fly to lights (Borror and DeLong, 1971).

Hydroporus sp., TP.

Dent County: Bounds Branch Cave. **Pulaski County:** Wilson Cave No. 1. **Washington County:** Corral Cave. Adults were collected from muddy bottom pools in total darkness and from beneath a stone in the entrance pool of a stream. A larva and an adult were collected from beneath rotting wood in a muddy bottom pool in the total darkness of the stream in Wilson Cave No. 1. The larva had pigmented ocelli typical of an epigeal species, as one would expect (Spangler, pers. comm.).

Hydrovatus sp., TX.

Pulaski County: Little Cave. An adult was collected from beneath a stone in a slow riffle of the stream near the entrance.

Family Elateridae

Agriotes insanus Candeze, AC.

Texas County: Unnamed Crawlway Cave. An adult was collected on the floor just inside the entrance.

Agriotes sp., AC.

Christian County: Swan Cave. A single adult specimen was discovered beneath a stone in the entrance.

Cardiophorus sp., TX.

Carter County: Devils Run Hollow Cave. A larva was collected in loose moist soil beneath the debris of an eastern wood rat nest.

Hemicrepidius sp., AC.

Howell County: Jim Ridge Cave. An adult was collected from leaves mixed with eastern wood rat droppings, just inside the entrance.

Limonium flavomarginatus Knull, TP.

Barry County: Moonshine Hole Cave. **Camden County:** Fort Cave and Island Pit Cave. **Miller County:** Buzzards Perch Cave. **Phelps County:** Coon Cave No. 1, Lane Cave and Phelps Cave. **Washington County:** Oure Cave. Only larvae were collected from caves. Larvae were found beneath stones, in leaf debris and loose soil in all cave zones. These larvae were originally identified as *Ctenicera* near *cylindriciformis* (Herbst), but recent taxonomic revisions favor the presently used name.

Dr. Edward Becker and the author collected adults and larvae of this species from two Missouri caves. Becker (pers. comm.) stated that larval *L. flavomarginatus* have morphological characteristics of the genus *Athos*, but adult *Athos* have not been collected from Missouri caves. Adults and larvae of *L. flavo-*

marginatus were reported from bat guano by Martin (1980) in Tumbling Creek Cave, Taney County, Missouri, where they were reproducing successfully. Martin (1980) considered the bat guano in the cave a similar niche to eqigean populations which are phytophagus.

Limonium plebejus (Say), AC.

Camden County: Sassafras Cave. An adult was collected in wet leaves just inside the steeply sloping entrance.

Limonium stigma (Herbst), AC.

Christian County: Rattlesnake Cave.

McDonald County: Long Cave. Adult specimens were collected from loose soil near the entrance and beneath dry wood in soil in total darkness.

Limonium sp., TP or TX?

Iron County: Cave Hollow Cave Annex. A larva was collected from beneath a stone in twilight. This specimen was apparently not *L. flavomarginatus*.

Melanotus depressus (Melsheimer), AC.

Carter County: Mosquito Cave. An adult was collected on a mud bank near water, during July.

Melanotus sp., AC.

Camden County: Sassafras Cave. An adult was collected from wet leaves in the twilight.

Family Elmidae

Optioservus sandersoni Collier, TP?

Franklin County: Copper Hollow Spring Cave. An adult was collected from beneath a stone in the spring flow in the entrance. Eight larvae were collected from beneath stones in the same spring flow and identified as *Optioservus* sp.

Optioservus sp., TP?

Franklin County: Copper Hollow Spring Cave. Eight larvae were collected from beneath stones in the spring flow in the entrance. An adult was collected from the same habitat and identified as *O. sandersoni*. The larvae of most species of Elmidae occur in the same situations as the adults (Borror and DeLong, 1971).

Family Haliplidae

Peltodytes muticus, AC.

Shannon County: Blue Spring. A single specimen was collected from the surface pool in sunlight.

Family Histeridae

Hister interruptus Beauvois, TX.

Barry County: Bear Waller Cave. **Camden County:** Pin Oak Cave. **Miller County:** Potato Cave. **Phelps County:** Apple Dumping Cave. **Pulaski County:** Wilson Cave

No. 1. The adult specimens from Apple Dumping Cave were collected from eastern wood rat droppings and soil, during April, and were very lethargic. The specimen from Bear Waller Cave was found near dung in total darkness. Additional specimens were collected in the loose soil of a turkey vulture nest in total darkness, and from a mud bank in twilight.

Hister sp., AC.

Phelps County: Hanley Cave. Adult specimens were collected from loose soil in total darkness. The specimen from Hanley Cave was compared to all species of *Hister* in the National Collection and no identical specimens were found (Kingsolver, pers. comm.).

Peck and Lewis (1978) reported *Hister* sp. from an Illinois cave.

Hypocaccus sp., AC.

Wright County: Bill Dyer Lead Mine Cave. An adult specimen was collected from the leaf litter below the pit entrance.

Xestopyge conjunctum Say, AC.

Oregon County: Three Entrance Cave. An adult specimen was taken from the debris of a turkey vulture nest in twilight.

Family Hydrophilidae

Laccobius agilis Rand, AC.

Shannon County: Jam Up Cave. **Stone County:** Mossy Spring Tunnel Cave. The specimen collected in Mossy Spring Tunnel Cave was found on a piece of wood in twilight. The Jam Up Cave specimen was swimming near the surface of a pool in twilight. Hydrophilid beetles might survive in the twilight of cave streams where they could scavenge on abundant food materials.

McDaniel and Smith (1976) reported *Tropisternus m. mexicanus* LePorte (Coleoptera: Hydrophilidae) from the twilight of an Arkansas cave.

Family Lampyridae

prob. *Photinus* sp., AC.

Howell County: Willow Branch Cave.

Phelps County: Garco Cave. These larvae were found beneath a stone in the entrance and in wet leaves in total darkness, during May and June respectively.

prob. *Photuris* sp., AC.

Howell County: Hay Holler Cave. **St. Louis County:** Woods Cave. Larvae were collected from leaves mixed with rotting wood near the entrance and beneath a stone in total darkness, during June and July.

Family Leiodidae

Catops n. sp. 1, TP.

Iron County: Cave Hollow Cave Annex. An adult was collected from beneath a stone in twilight.

This species is apparently widespread in the eastern United States (Peck, pers. comm.).

Catops sp., AC.

Howell County: Jim Ridge Cave. One adult was found in eastern wood rat droppings near the entrance.

Catops graciosus Blanchard is a widespread troglophile in North America and is frequently found in eastern caves (Peck and Lewis, 1978).

Colenis impunctata LeConte, AC.

Carter County: Coalbank Cave. An adult was collected from a dead bat in total darkness.

Prionochaeta opaca Say, TP.

Madison County: Marsh Creek Cave No. 1 and Marsh Creek Cave No. 2. **Miller County:** Potato Cave. **Oregon County:** Bat Cave, Buzzard Cave and Three Entrance Cave. **Shannon County:** Douglas Hollow Cave. **St. Louis County:** Overhang Cave. The adult specimen from Douglas Hollow Cave was collected in March from wet leaves in the entrance. Other adult specimens were collected from a turkey vulture nest in twilight, from a mud bank and from near guano piles. Larvae from the two Madison County caves were collected from bat guano in total darkness. Larvae from Potato Cave and Buzzard Cave were collected from a turkey vulture nest. Eight larvae were collected from a turkey vulture nest in the twilight of Three Entrance Cave. This species has been previously reported from a vulture nest in Maryland and has been observed feeding on bat guano (Peck, 1977).

Peck (1977) stated that the species was widely distributed in regions of temperate eastern North America covered by deciduous broad-leaved forests. A generalized scavenger on decaying organic matter, the species is known from several epigeal and cave habitats in Missouri (Peck, 1977). It is more frequent in caves in the southern half of its range (Peck, pers. comm.).

Ptomaphagus cavernicola Schwarz, TP.

Barry County: Chimney Rock Cave and Panther Cave. **Boone County:** Devils Icebox Cave. **Camden County:** Onyx Mine Cave, Ozark Caverns, Pin Oak Cave and River Cave. **Carter County:** Lost Man Cave, Mosquito Cave, Secesh Cave, Turley Cave and Upper Camp Yarn Cave. **Crawford County:** Bear Cave, Cathedral Cave, Narrows Cave and Onondaga Cave. **Dent County:** Bounds Branch Cave. **Franklin County:** Bear Cave and Fisher Cave. **Howell County:** Jim Ridge

Cave and Spring Creek Cave. **Iron County:** Cave Hollow Cave. **Jefferson County:** Bollefer Spring Cave. **Lawrence County:** Turnback Cave. **Madison County:** Marsh Creek Cave No. 1. **Oregon County:** Bat Cave, Corbet Cave, Dead Man Cave, Panther Cave, Three Entrance Cave, Whites Creek Cave and Willow Tree Cave. **Ozark County:** Bear Cave. **Phelps County:** Coon Cave No. 3, Garco Cave and Tree Root Cave. **Pulaski County:** Great Spirit Cave, Peninsula Cave and Ryden Cave. **Shannon County:** Bunker Hill Cave, Davis Cave, Keyhole Cave, Powder Mill Creek Cave, Round Spring Cavern and Sycamore Cave. **Texas County:** FS Cave 130, FS Cave 135 and Spring Cave No. 32. **Washington County:** Brazil Pit Cave, Great Scott Cave, Little Scott Cave and Mossy Spring Cave. Adults were collected most often from dung and bat guano in total darkness. Other adult specimens were collected from fungal mycelia, wood and beneath animal carcasses. Dozens of individuals have been observed beneath a single dead bat and small pieces of fresh dung. Adults were common at dung baits throughout Onondaga Cave. Larvae were collected from January through October, in direct association with adult *P. cavernicola*. Larvae were collected most often from bat guano, dung, bat carcasses and turkey vulture nests.

Barr (1963) reported collecting many larvae of this species from raccoon (*Procyon lotor*) dung in a cave in Stone County, Missouri, during January. This species was commonly found on guano piles in Cat Hollow Cave, Dallas County, Missouri (Oesch and Hansen, 1960). Reynolds (1959) reported the species as abundant on animal scats and associated with bat guano in three Benton County caves, Missouri. Additional Missouri records are from caves in Boone, Camden, Franklin, Greene, Jefferson, Laclede, McDonald, Phelps, Pulaski, Stone and Texas counties (Barr, 1963; Peck, 1973; Peck and Lewis, 1978).

The species is apparently widely distributed in the Ozark region, ranging from northeastern Mexico to the Ozarks in the U.S. and southeast to Florida (Peck, 1973). Peck (1982a) reported new records of this species from Texas, Oklahoma, Arkansas and Missouri. Youngsteadt and Youngsteadt (1978) reported the species from caves in three Arkansas counties, but the species is apparently absent in Illinois (Peck, 1973). This species has been taken in five non-cave areas in Oklahoma, Florida and Georgia (Peck, 1982b and pers. comm.). Beforehand, the species was known from only a single epigeal record (Peck and Lewis, 1978).

Family Leptinidae

Leptinus americanus LeConte, AC.

Ozark County: Morrison Knobs Cave. An adult was collected from loose soil and leaves near the entrance, where it had apparently fallen from its host.

This species is an external parasite of insectivores and rodents (Peck, 1982c), restricted in distribution to the central United States, west of the Mississippi River. Only four records of *L. americanus* were previously known from Missouri.

Platypsyllus castoris Ritsema, AC.

Texas County: Unnamed Cave No. 2. An adult specimen was collected from beneath wood in this small cave, which was utilized as a den by a beaver (*Castor canadensis*). This species and one other species of Leptinidae are known to occur in the nests and/or fur of beavers (Borror and DeLong, 1971).

Family Lucanidae

Pseudolucanus placidus Say, AC.

Wright County: Bill Dyer Lead Mine Cave. An adult was collected from the leaves below the shallow pit entrance.

Family Melandryidae

Scaptia sp., AC.

Miller County: Buzzards Perch Cave. Three larvae were collected from leaves and eastern wood rat droppings near the entrance, during May.

Family Meloidae

Meloe sp., AC.

Boone County: Hog Graveyard Cave. An adult was discovered on a mud bank below the pit entrance.

Family Nitidulidae

Pallodes pallidus Beauvois, AC.

Crawford County: Narrows Cave. An adult was collected from leaves near the entrance.

Family Phengodidae

Phengodes sp., AC.

Boone County: Polly's Pot Cave. **Shannon County:** Blue Spring. **Wright County:** Bill Dyer Lead Mine Cave. A larva was collected from the sunlit surface pool at Blue Spring and another from a muddy pool in the total darkness of Polly's Pot Cave. The larva from Wright County was collected from leaves below the shallow pit entrance.

Family Pselaphidae

Undetermined genus and species, AC.

Crawford County: Narrows Cave. **Dent County:** Bounds Branch Cave. Adult specimens were collected from a wall pocket in twilight and from beneath wood in total darkness.

Peck and Lewis (1978) reported *Batrisodes rossi* Park (Coleoptera: Pselaphidae) from a pitfall trap at the rear of an Illinois cave.

Family Psephenidae

Ectopria nervosa (Melsheimer), AC.

Washington County: Pipe Spring Cave. A single specimen was collected from beneath a stone in the stream flow from the entrance, during April.

Family Ptilodactylidae

Ptilodactyla sp., TX?

Howell County: Willow Branch Cave. **Phelps County:** Garco Cave and Pillman Cave. **Pulaski County:** Kerr Cave. A larva was collected from beneath a stone in the entrance during May. One larva was collected from eastern wood rat droppings in twilight, and another from beneath wood in total darkness, both in November. A pupa was collected from a wet leaf in total darkness, during June.

Undetermined genus and species, AC.

St. Louis County: Overhang Cave. **Wright County:** Bill Dyer Lead Mine Cave. Adults were collected from the ceiling near the entrance and on the wall in twilight, during July.

Family Scaphidiidae

Undetermined genus and species, AC.

Carter County: Coalbank Cave. **Crawford County:** Onondaga Cave. **Wright County:** Bill Dyer Lead Mine Cave. Specimens were collected from leaf litter below a shallow pit entrance and from mud banks in total darkness.

Family Scarabaeidae

Aphodius ruricola Melsheimer, AC.

Texas County: Unnamed Cave No. 1. Two adult specimens were extracted from inside fresh dung found in twilight.

Aphodius serval Say, AC.

Boone County: Hog Lot Cave. An adult specimen was collected from beneath a stone in leaf litter near the entrance, during January.

Aphodius n. sp., TP?

Barry County: Chimney Rock Cave. **Pulaski County:** Little Cave. **Texas County:** Hilltop Cave. Two larvae were collected from beneath moist dung in the total darkness of

Little Cave. Adults were collected from eastern wood rat droppings in Hilltop Cave and from beneath an eastern wood rat carcass in the total darkness of Chimney Rock Cave.

Relatives of this dung-feeding beetle are all inhabitants of rodent nests: one species in flying squirrel (*Glaucomys volans*) nests in the eastern U.S., one species in flying squirrel (*Glaucomys sabrinus*) nests on the west coast, and one species in the wood rat (*Neotoma* sp.) nests on the west coast (Gordon, pers. comm.).

Aphodius sp., TX?

Texas County: Unnamed Cave No. 1. An adult and a larva were extracted from inside fresh dung found in twilight. This species was evidently different from *A. ruricola* collected from the same dung in this cave.

Deltochilum gibbosum Fabricius, AC.

Oregon County: Two Entrance Cave. An adult was collected from an eastern wood rat nest in twilight.

Diplotaxis harperi Blanchard, AC.

St. Louis County: Moss Pit Cave. An adult was found in leaf litter below the pit entrance.

Geotrupes splendidus Fabricius, AC.

Pulaski County: Kerr Cave. Three adults were collected from fresh dung in total darkness.

Onthophagus cavernicollis Howden and Cartwright, TP.

Barry County: Currey Cave. **McDonald County:** Long Cave. **Oregon County:** Two Entrance Cave. **Taney County:** Back Door Cave. **Texas County:** FS Cave 135 and Unnamed Cave No. 1. Adults were collected from beneath wood, beneath dung, in eastern wood rat droppings and inside fresh dung in twilight and total darkness, during May. Other specimens were collected from the leaves and sticks of an eastern wood rat nest and from leaves in twilight, during July. The species is known mostly from caves in Missouri, Arkansas, Oklahoma and Texas (Peck, pers. comm.).

Onthophagus orpheus orpheus Panz., TX.

Carter County: Upper Camp Yarn Cave.

Oregon County: Two Entrance Cave.

Texas County: Unnamed Cave No. 1. Adults were collected from beneath stones in rotting wood, in loose soil, from inside fresh dung and from an eastern wood rat nest, all in twilight, during May and July.

Onthophagus n. sp., TX.

Phelps County: Hanley Cave. An adult was collected from beneath a stone in loose soil near the entrance. The closest species to this undescribed species are all known from wood rat (*Neotoma* sp.) nests (Gordon, pers. comm.).

Phyllophaga balia (Say), AC.

Camden County: River Cave. An adult was collected from the edge of a rimstone pool in total darkness. This specimen was evidently washed in by a spring flood just previous to the date of collection.

Serica serica Illiger, AC.

Camden County: Island Pit Cave. An adult was found in loose soil, leaves and wood in twilight.

Serica sp., AC.

Camden County: Island Pit Cave. This adult was collected from loose soil, leaves and wood in twilight. This female specimen evidently could not be determined to species, because taxonomic characteristics are based on male specimens.

Trox scaber (Linnaeus), TX.

Miller County: Buzzards Perch Cave. This adult specimen was collected from beneath excrement in a turkey vulture nest.

Family Silphidae

Necrophilus pettitti Horn, AC.

Jefferson County: Reiter Cave. **Shannon**

County: Davis Cave. The adult specimen from Reiter Cave was collected from a small, muddy hole in the wall in total darkness. The adult specimen from Davis Cave was found beneath a dead millipede, in total darkness.

The species is reportedly taken most often from decomposing material, usually on or in dung and carrion baits, and pit traps (Peck, 1981). Peck further stated that the general distribution of the species is from New York, Ontario and Michigan, southwards to Alabama, Georgia and northern Florida. These are the first records of the species from Missouri (Peck, pers. comm.).

Family Staphylinidae

Aleochara castaneipennis Mannerheim, TX.

Barry County: Cave of the Winds and

Shelter Cave. **Camden County:** Camp Haw-

thorn Cave. **Crawford County:** Tube Cave.

Oregon County: Three Entrance Cave.

Adult specimens were collected from animal bones in total darkness, from beneath dung and beneath a stone in twilight. Additional specimens were collected from a turkey vulture nest in twilight, and from beneath a stone in the entrance.

Aleochara sp. 1, TX.

Crawford County: Moonshine Cave. **Pettis**

County: Dining Room Cave. Adults were collected from beneath a stone in the entrance

and on the floor in total darkness, during March and April respectively. The specimen from Dining Room Cave is one of two *Aleochara* collected.

Aleochara sp. 2, TX.

Pettis County: Dining Room Cave. An adult was collected from the floor in total darkness during April.

Aleochara n. sp., TX.

Crawford County: Bat Cave. An adult was collected from beneath a stone in total darkness. This apparently undescribed species will be incorporated in a revision of Nearctic *Aleochara* (Klimasewski and Peck, pers. comm.).

Aleochara n. sp. and subsp., TX.

Barry County: Chimney Rock Cave. An adult was collected from beneath a wood rat carcass in total darkness.

The species is close to the subspecies *Echochara*, and other records from caves will be included in a revision of the Nearctic *Aleochara*. This is the only Missouri record.

Aleochara (*Emplenota*) sp., TP?

Shannon County: Douglas Hollow Cave. An adult was collected from wet leaves in the entrance, during March.

Emplenota is considered a subgenus of *Aleochara*, with three Nearctic species restricted to seashores (Klimasewski and Peck, pers. comm.). A very frequent troglophilic inhabitant of caves in the southern United States is *Aleochara* (*Echochara*) *lucifuga* Casey, which has not been found in Missouri (Peck, pers. comm.).

Aleochara spp. undetermined, TX.

Carter County: Coalbank Cave. **Dent County:** Bounds Branch Cave. **McDonald County:** Long Cave. **Oregon County:** Bat Cave and Corbet Cave. **Ozark County:** Buzzard Cave. **Shannon County:** Bootlegger Cave. **Taney County:** Marholtz Cave. **Texas County:** FS Cave 130 and Unnamed Cave No. 5. These undetermined adult specimens were collected from dung, bat guano, dry wood, beneath stones and beneath a dead bat.

Atheta sp. 1, TP.

Barry County: Bear Waller Cave and Cliff Notch Cave. **Camden County:** Pin Oak Cave. **Carter County:** Cat Track Cave, Secesh Cave and Upper Camp Yarn Cave. **Crawford County:** Bear Cave and Little Crystal Cave. **Franklin County:** Mine Cave, Outlaw Cave, Panther Cave, Sprinkle Spring Cave and Wildcat Cave. **Iron County:** Cave Hollow Cave. **Lawrence County:** Turnback Cave. **Madison County:** Marsh Creek Cave No. 1. **Oregon County:** McDowell Cave. **Phelps County:** Coon Cave No. 3. **Pulaski**

County: Little Cave. **Shannon County:** Bat Cave and Larkin Ford Cave. **Texas County:** FS Cave 135. **Washington County:** Blacksnake Hole Cave. The majority of specimens were collected from dung and bat guano in total darkness, but specimens were also collected from beneath rotting wood and animal carcasses. Larvae, identified only as Staphylinidae, were collected in direct association with these adults. This species was associated with *Quedius fulgidus* on bat guano in Turnback Cave, and on dung with *Atheta* sp. 4 in Sprinkle Spring Cave.

Atheta sp. was reported from Mystery Cave, Perry County, Missouri, and from caves in two Illinois counties (Peck and Lewis, 1978). Reynolds (1959) reported *Atheta* sp. from scats and bat guano in three caves in Benton County, Missouri. The species is known from caves in Taney and Ste. Genevieve counties, Missouri, and from caves in Florida, Georgia, Indiana, Iowa, Kentucky, Pennsylvania and Virginia (Klimasewski and Peck, pers. comm.).

Atheta sp. 2, TP.

Carter County: Buzzard Cave. This adult specimen was collected from beneath rotting wood in the twilight of this small cave, which was used by a turkey vulture for a nesting site.

Atheta sp. 4, TP.

Barry County: Last Cave. **Franklin County:** Sprinkle Spring Cave. **Howell County:** Willow Branch Cave. **Ripley County:** Panther Cave. Adults were collected from beneath dung and wood in twilight and total darkness.

The species is known from caves in Alabama, Indiana and Virginia (Klimasewski and Peck, pers. comm.).

Atheta sp. 5, TP.

Christian County: Camp Ridge Cave. **Texas County:** Unnamed Cave No. 1. Adult specimens were collected from beneath a stone in leaves in twilight and near fresh dung in total darkness.

The species is known from caves in Alabama, Florida, Georgia, Kentucky and Tennessee (Klimasewski and Peck, pers. comm.).

Derops (*Rimulicola*) *divalis* (Sanderson), TP.

Barry County: Moonshiner Cave and Radium Cave. **Phelps County:** Apple Dumpling Cave. Specimens were collected from beneath a stone in total darkness, beneath wood in twilight and beneath dung in total darkness.

Craig (1977) reported this species under the name *R. divalis* Sanderson from Onondaga Cave, Crawford County, Missouri. Dung bait stations scattered throughout Onondaga Cave during January did not produce any specimens.

Peck and Lewis (1978) reported *R. divalis* from Monroe and Pike counties, Illinois. The genus has only this single species in the United States in Arkansas, Missouri and Illinois. Otherwise, the genus occurs in Japan and southeast Asia (Peck, pers. comm.).

Erichsonius sp., TX.

Howell County: Ralph Ridge Pit Cave.

McDonald County: Long Cave. **Oregon**

County: Surprise Sinkhole Cave. Adults were collected from leaves at the bottom of the shallow pit entrance to Surprise Sinkhole Cave, and in leaves in twilight and total darkness in the other two caves.

Erichsonius nanus Horn was reported from a single cave in Illinois (Peck and Lewis, 1978).

Hesperus baltimorensis Gravenhorst, TX?

Crawford County: Onondaga Cave. An adult was collected from beneath rotting lumber below the vertical ventilation shaft near the old Missouri entrance, in total darkness.

Homeotarsus sp., AC.

Franklin County: Mack Cave. An adult was collected from beneath a stone in the entrance.

Peck and Lewis (1978) classified *H. bicolor* (Gravenhorst) and *Homeotarsus* (*Gastrolobium*) sp. as accidentals from caves in Illinois.

Lathrobium sp., AC.

Boone County: Hog Lot Cave. **Oregon**

County: Surprise Sinkhole Cave. Adults were found in leaf litter near the entrances.

Lesteva sp., prob. *pallipes* LeConte, TP.

Barry County: Lohmer Cave. **Boone County:** Hog Lot Cave. **Camden County:** Camp Hawthorn Cave. **Carter County:** Four Hole Cave. Three adults were collected from beneath stones in the entrances, and five specimens were collected from beneath stones in twilight.

Lesteva pallipes is reported from several caves in three Illinois counties (Peck and Lewis, 1978), but no known Missouri records existed previous to this account.

Megarathrus sp., AC.

Barry County: Radium Cave. An adult was collected from a wet leaf near the entrance.

Neobisnius sp., AC.

Crawford County: Bear Cave. An adult was collected from an area of burrows in a mud bank in twilight. These burrows were inhabited by *Trichotichnus vulpeculus* Say (Coleoptera: Carabidae).

Peck and Lewis (1978) reported *N. paederoides* LeConte from Illinois and *Neobisnius* sp. from Mystery Cave, Perry County, Missouri.

Oxypoda sp., TX or AC?

Miller County: Potato Cave. An adult was collected from beneath a stone in a turkey

vulture nest in total darkness. A larva, identified as Staphylinidae only, was collected with this specimen.

Philonthus blandus Gravenhorst, AC.

Wright County: Bill Dyer Lead Mine Cave. An adult was collected from leaf litter below the shallow pit entrance. This is one of three *Philonthus* reported from this cave.

Two species, *P. microphthalmus* Horn and *Philonthus* sp., were classified as accidentals from Illinois caves by Peck and Lewis (1978).

Philonthus brunneus Gravenhorst, AC.

Boone County: Little Dome Cave. **Wright**

County: Bill Dyer Lead Mine Cave. The adult from Little Dome Cave was collected from beneath dung in twilight. The specimen from Wright County was one of three *Philonthus* collected from leaf litter below the shallow pit entrance.

Philonthus sordidus Gravenhorst, TP or TX?

Miller County: McDowell Cave. Four adults were collected from bat guano in total darkness, during May.

Philonthus sp., AC.

Wright County: Bill Dyer Lead Mine Cave. This adult was one of three specimens of *Philonthus* collected from leaf litter below the shallow pit entrance.

Quedius capucinus Gravenhorst, TX.

Boone County: Little Dome Cave. An adult was collected from beneath dung in twilight, during January.

Reynolds (1959) reported this species from decaying pieces of wood in Cole Camp Cave, Benton County, Missouri.

Quedius erythrogaster Mannerheim, TP.

Barry County: Chimney Rock Cave and Moonshine Hole Cave. **Boone County:** Little Dome Cave. **Callaway County:** Spaghetti Cave. **Camden County:** Island Pit Cave and My Cave. **Carter County:** Cradle Hollow Cave and Mitchell Hollow Cave. **Crawford County:** Onondaga Cave and Scotia Cave. **Franklin County:** Hidden Room Cave. **Hickory County:** Stovepipe Cave. **Howell County:** Tabor Cave. **Iron County:** Boulder Cave. **Lincoln County:** Creech Cave. **Madison County:** Marsh Creek Cave No. 2. **McDonald County:** Long Cave. **Miller County:** DeGraffenreid Spring Cave and McDowell Cave. **Oregon County:** Bat Cave, Surprise Sinkhole Cave and Willow Tree Cave. **Ozark County:** Buzzard Cave. **Phelps County:** Coon Cave No. 3, Gable Spring Cave, Garco Cave, Phelps Cave and Rogers Cave. **Pike County:** DuChemin Cave. **Pulaski County:** Kerr Cave and Little Cave. **Shannon County:** Bald Eagle Cave, Bootlegger

Cave, Cave Hollow Cave and Hermit Cave.

Taney County: Marholtz Cave. **Texas County:** Barn Hollow Cave, Hilltop Cave and Unnamed Cave No. 5. **Washington County:** Chara Cave, Corral Cave and Rattlesnake Pit Cave. From a total of 62 specimens collected, 45 specimens (73%) were associated with dung and bat guano (with only seven of these specimens collected from bat guano). Other materials from which specimens were collected, included leaves, wood, beneath stones and beneath an animal carcass. Smetana (1971) reported this species as commonly found on animal dung in caves. These records apparently represent the first accounts of this species from caves in Missouri, although *Q. capucinus* reported by Reynolds (1959) could conceivably have been *Q. erythrogaster*. Larval Staphylinidae have been found in the same spot as adult *Q. erythrogaster* in Boulder Cave (Iron County), Creech Cave (Lincoln County), Marsh Creek Cave No. 2 (Madison County), McDowell Cave (Miller County), Little Cave (Pulaski County) and Hercules Lookout Cave (Taney County).

The species is transcontinental and common in caves (Smetana, 1971). Peck and Lewis (1978) reported the species from caves in seven Illinois counties.

Quedius fulgidus (Fabricius), TP.

Lawrence County: Turnback Cave. Three specimens were collected from bat guano on a mud bank, far from either entrance. A larval Staphylinidae was collected with these adult specimens, but *Atheta* sp. 1 was collected from the same spot also.

This is an introduced European species, widely spread over much of North America and often occurs in caves (Smetana, 1971). The species was reported from caves in three Illinois counties (Peck and Lewis, 1978), but this account is the first known Missouri record.

Quedius spelaeus Horn, TP.

Boone County: Conners Cave. A species was collected from beneath dung in total darkness, during February. A larval Staphylinidae was collected from this spot also.

The species is known from caves in Illinois (Peck and Lewis, 1978) and is more commonly found in caves in the northeastern quarter of its range in the U.S. (Smetana, 1971).

Sepidophilus littorinus (Linnaeus), AC.

Phelps County: Yancy Mills Cave No. 2. A specimen was collected from beneath a large flat rock in loose soil in the entrance.

Sepidophilus opacus (Say), AC.

Wright County: Bill Dyer Lead Mine Cave. An adult specimen was collected from the leaves at the bottom of the shallow pit entrance.

Stenus sp., AC.

Washington County: Blacksnake Hole Cave. An adult was found beneath a stone in the entrance.

Peck and Lewis (1978) reported *Stenus alacer* Casey from Klump Cave, Perry County, Missouri.

Stilicolina sp., AC.

Howell County: Mud Spring Cave. An adult was collected from very wet dung in total darkness.

Tachinus fimbriatus Gravenhorst, AC.

Carter County: Mitchell Hollow Cave. An adult specimen was collected from beneath dry dung in total darkness, during January.

Tachinus fumipennis Say, AC.

Barry County: Last Cave. A specimen was collected from beneath dung in twilight. A larva, identified as Staphylinidae only, was collected with this species.

Tachinus scrutator Gemminger and Harold, TX.

Carter County: Four Hole Cave. **Phelps County:** Arches Natural Tunnel Cave. Five specimens were collected from beneath a stone in the twilight of Four Hole Cave. One specimen from Arches Natural Tunnel Cave was collected from beneath a stone in the entrance.

Craig (1977) reported the species from Nameless Cave, Crawford County, Missouri.

Tachinus sp., TX.

Boone County: Little Dome Cave. Two specimens were collected from beneath dung in twilight, during January.

Tachynsa sp. 1, TP.

Barry County: Lohmer Cave. **Ozark County:** Huffman Cave. **Pulaski County:** Ryden Cave. **Taney County:** Dicus Cave and Hercules Lookout Cave. Adults were collected from beneath stones and dung in twilight and total darkness.

Klimasewski and Peck (pers. comm.) recently reviewed the Aleocharinae (Coleoptera: Staphylinidae) from caves in the eastern United States, and have additional records of the species from Tennessee.

Tachynsa sp. 3, TP.

Crawford County: Bear Cave. Two adult females were collected from a mud bank in twilight. These specimens were associated with burrows in a mud bank which *Trichotichnus vulpeculus* Say (Coleoptera: Carabidae) had colonized.

Trichophya sp., TX.

Camden County: River Cave. Two adults were collected from wet rotting wood and leaves in total darkness.

Undetermined genus and species, TP?

Barry County: Mushroom Rock Cave. **Boone County:** Conners Cave. **Camden County:** Pin Oak Cave. **Christian County:**

Camp Ridge Cave. **Franklin County:** Outlaw Cave and Wildcat Cave. **Howell County:** Jim Ridge Cave. **Iron County:** Boulder Cave. **Lawrence County:** Turnback Cave. **Lincoln County:** Creech Cave. **Madison County:** Marsh Creek Cave No. 1 and Marsh Creek Cave No. 2. **Miller County:** McDowell Cave and Potato Cave. **Ozark County:** Bear Mountain Cave. **Phelps County:** Garco Cave. **Pulaski County:** Knife Cave. **Shannon County:** Davis Cave and Medlock Cave. **Taney County:** Hercules Lookout Cave. These records represent larvae and a single pupa collected from caves from January through August.

Larvae were collected in association with adult *Atheta* sp. 1 from dung on a mud floor in Outlaw Cave, and from a dead bat in Wildcat Cave, both Franklin County. Adult *Atheta* sp. 1 and these undetermined larvae were collected from a mud bank near bat guano in Turnback Cave, Lawrence County, but three adult *Q. fulgidus* were collected from the same spot also. Adult specimens of *Atheta* sp. 5 were collected with these undetermined larvae reported from beneath a stone in leaves in Camp Ridge Cave, Christian County. Larvae were collected in direct association with adult *Atheta* sp. 1 and *Atheta* sp. 5 from beneath dung in Sprinkle Spring Cave. Three adult *Atheta* sp. 1 were collected with a larva from bat guano in Marsh Creek Cave No. 1, Madison County. In Little Cave, Pulaski County, adult *Atheta* sp. 1 and *Q. erythrogaster* were collected from the same dung where these undetermined larvae were found. An adult *Oxypoda* sp. from Potato Cave, Miller County was collected with a larva from beneath a stone in a fresh turkey vulture nest. These larvae were collected in association with adult *Q. erythrogaster* from dung in Boulder Cave, Creech Cave and Little Cave. Adult *Q. erythrogaster* were collected with larvae from bat guano in Marsh Creek Cave No. 1 and McDowell Cave. Adult *Q. erythrogaster* and *Tachynsa* sp. 1 were collected with a larva and a pupa from Hercules Lookout Cave. Three adult specimens of *Q. fulgidus* were collected in association with larvae from bat guano in Turnback Cave, but an adult *Atheta* sp. 1 was collected from the same spot also. Larvae and an adult *Q. spelaeus* were collected from beneath dung in total darkness in Connors Cave. Adult *Tachinus fumipennis* were collected with these undetermined larvae from dung in Last Cave. An adult *Tachynsa* sp. 1 was collected with an undetermined larva from beneath dung on a shelf in the total darkness of Hercules Lookout Cave.

Family Tenebrionidae

Neatus tenebrioides (Palisot), AC.

Pulaski County: Great Spirit Cave. An adult was collected from a mud bank near bat guano.

Tarpela micans (Fabricius), AC.

St. Louis County: Rockwoods Cave. An adult was collected near the entrance from the surface of a stone.

Order Psocoptera

Family undetermined

prob. *Psyllipsocus ramburii* (Selys Lonchamps), TP.

Barry County: Patton Cave and Shelter Cave. **Boone County:** Wasp Shelter Cave.

Camden County: Bear Cave No. 1, Camp Hawthorn Cave, Gar Cave, Potato Cave and River Cave. **Crawford County:** Cathedral Cave, Switchback Cave and V Cave. **Franklin County:** Fisher Cave. **Laclede County:** Mayfield Cave. **Madison County:** Marsh Creek Cave No. 1 and Marsh Creek Cave No. 2. **McDonald County:** Long Cave. **Ozark County:** Cowdry Cave. **Phelps County:** Pillman Cave, Unnamed Cave No. 2 and Zorumski Cave. **Pulaski County:** Wilson Cave No. 1. **Shannon County:** Beaver Cave, Brawley Cave, Cat Track Cave, Davis Cave and Larkin Ford Cave. **Taney County:** Marshall Cave. **Texas County:** FS Cave 130, FS Cave 135, Hilltop Cave, Unnamed Cave No. 1, Unnamed Cave No. 5 and Unnamed Cave No. 14. **Washington County:** Great Scott Cave. Specimens were collected most often from dry wood and loose soil.

This species is the most frequent United States cave psocopteran. The species is worldwide in distribution, by commerce, and associated with dried stored products. Most populations are parthenogenetic (Peck, pers. comm.).

Order Hemiptera

Family Ceratocombidae

Ceratocombus sp., poss. n. sp., AC.

Crawford County: Jagged Canyon Cave and Narrows Cave. **Washington County:** Camp Branch Cave. Adults were collected from a mud bank, the floor and the wall in total darkness. Additional adult specimens were collected from beneath stones and rotting wood in twilight. This specimen could be an undescribed species (Froeschner, pers. comm.).

Family Gerridae

Gerris nebularis Drake and Harris, AC.

Texas County: Unnamed Cave No. 2. An adult was collected from the wall near the entrance.

Gerris remigis Say, TX.

Barry County: Radium Cave and Sugar Silver Cave. **Boone County:** Conners Cave. **Camden County:** Ozark Caverns. **Crawford County:** Jagged Canyon Cave. **Ozark County:** Bat Cave. **Phelps County:** Kaintuck Hollow Natural Bridge Cave. **Pulaski County:** Great Spirit Cave. **Shannon County:** Blue Spring and Powder Mill Creek Cave. Males and females were collected most often from calm pools in twilight, but also from pools in the entrance. The specimens from Blue Spring were collected from the edge of the spring rise pool in slow water. Immature *Gerris* sp. were collected from Bat Cave, Ozark County and Powder Mill Creek Cave, Shannon County. This species is capable of being an important predator in the twilight zones of Missouri caves.

McDaniel and Smith (1976) reported this species from an Arkansas cave, where it was collected from the twilight.

Gerris sp., TX.

Oregon County: River Level Cave. **Ozark County:** Bat Cave. **Shannon County:** Powder Mill Creek Cave. **Washington County:** Great Scott Cave. These immature specimens were collected from surface pools near the entrance and in twilight. Adult *G. remigis* were collected in identical habitats in each cave above, except River Level Cave, Oregon County.

Limnogonus hesione Kirkaldy, AC.

Crawford County: Jagged Canyon Cave. An adult was collected from the stream near the entrance.

Limnopus canaliculatus (Say), AC.

Oregon County: Cooper Spring Cave and Mine Hollow Cave. One specimen was collected from leaf litter below the pit entrance to Mine Hollow Cave, and another from the deep entrance pool in Cooper Spring Cave. The name used here is synonymous with *G. canaliculatus* Say.

Family Pentatomidae

Menecles insertus (Say), AC.

Texas County: Unnamed Cave No. 13. An adult was collected from a wet log near the entrance.

Family Reduviidae

Oncocephalus sp., prob. *geniculatus* Stal., AC.

Wright County: Bill Dyer Lead Mine Cave. A nymph was collected from leaf litter at the bottom of the shallow pit entrance, during July.

Family Veliidae

Microvelia americana Uhler, TX.

Camden County: Ozark Caverns. **Carter County:** Mitchell Hollow Cave. **Christian County:** Rattlesnake Cave. **Crawford County:** Bear Cave. **Oregon County:** Bockman Spring Cave. **Pulaski County:** Great Spirit Cave. **Saline County:** Arrow Rock Cave No. 2. **Shannon County:** Blue Spring and Jam Up Cave. **Texas County:** John's Dilemma Cave and Unnamed Cave No. 2. **Washington County:** Camp Branch Cave. Some specimens were collected from beneath stones in pools, but most were collected from the surface of pools in twilight and in the entrance. This small species could be a predator of micro-invertebrate fauna in some cave streams, but would be limited to the entrance area.

Microvelia sp., TX.

Shannon County: Jam Up Cave. This specimen was collected on the surface of a pool in twilight, during October. Adult *M. americana* were collected from this same pool. The habitat found in the Jam Up Cave pool would be conducive to overwintering *Microvelia* immatures.

Order Homoptera

Family Cixiidae

Undetermined genus and species, AC.

Ozark County: Bear Mountain Cave. **Texas County:** Unnamed Cave No. 15. An adult and a nymph were discovered beneath a stone in total darkness, during April and May respectively.

Order Megaloptera

Family Corydalidae

Neohermes concolor Davis, TX.

Christian County: Pole Cave. **Ozark County:** Onyx Cave. **Pulaski County:** Little Cave. **Taney County:** Scenic Drive Cave. Larvae were collected from riffles near the entrance and from muddy pools in total darkness.

Craig (1977) reported *Chauliodes* sp. (Megalo-
ptera: Corydalidae) from Mud River Cave,
Crawford County, Missouri.

Nigronia serricornis (Say), TX.

Callaway County: Spaghetti Cave. **Franklin County:** Copper Hollow Spring Cave and Fisher Cave. **Jefferson County:** Reiter Cave. **Phelps County:** Little Piney Cave. **Texas County:** Unnamed Cave No. 1. A larva was collected from beneath a stone in the entrance pool of Spaghetti Cave during February. Other larvae were collected from pools in the stream in total darkness, and from an isolated drip pool in the entrance. An adult was collected from the wall of the unnamed Texas County cave during May.

Nigronia sp., prob. *serricornis* (Say), TX.

Washington County: Corral Cave. This larval specimen was collected from beneath animal dung in total darkness.

Order Trichoptera

Family Glossasomatidae

Agapetus sp., TX.

Franklin County: Copper Hollow Spring Cave. **Washington County:** Pipe Spring Cave. Larvae were attached to the bottom of stones in the cave stream near the entrance.

Ross (1938) reported *Agapetus artesus* Ross as known only from Greer Spring, Oregon County, Missouri.

Family Hydropsychidae

Diplectrona metaqui Ross, AC.

Oregon County: Bat Cave. Larvae were collected from beneath stones in a stream riffle during July. These records could possibly be the first known account of this species from Missouri (Harp, pers. comm.).

Potamyia sp., AC.

Washington County: Pipe Spring Cave. A larva was collected from beneath a stone in the stream, near the entrance.

Family Lepidostomatidae

Lepidostoma sp., TX.

Barry County: Deer Leap Cave, Mushroom Rock Cave and a small hillside spring (seep).

Christian County: Marhud Cave No. 3.

Oregon County: Bockman Spring Cave.

Taney County: Hercules Lookout Cave.

Texas County: Bear Cave, John's Dilemma Cave and Spring Cave No. 32. Specimens were found beneath leaves, wood and stones in the

entrance. The larvae in Mushroom Rock Cave were clinging to roots in a pool in total darkness.

There are only two American genera, *Lepidostoma* and *Theliopsyche*, with larvae known from streams and springs (Borrer and DeLong, 1971).

Theliopsyche sp., TX.

Dent County: Bounds Branch Cave. Five larvae were collected from beneath rotting leaves in the stream, just inside the entrance.

Family Limnephilidae

Ironoquia sp., AC.

Pike County: DuChemin Cave. **Warren County:** tributary to Dry Fork Creek. Larvae were collected from beneath stones in the tunnel-like DuChemin Cave, and from beneath stones in the surface tributary to Dry Fork Creek.

Neophylax sp., TX.

Franklin County: Copper Hollow Spring Cave. Twelve specimens were collected from many individuals clinging to the bottom of stones in the stream flow in the entrance.

Pseudostenophylax sp., AC.

Phelps County: Kaintuck Hollow Natural Bridge Cave. Only one early instar larva was collected from a small shallow pool in the entrance, during January.

Pycnopsyche sp. 1, TX.

Christian County: White Worm Spring Cave. **Phelps County:** Arches Natural Tunnel Cave and Kaintuck Hollow Natural Bridge Cave. Late instar larvae with stone cases were collected from beneath leaves in the entrance and in twilight, during April. A larva from Kaintuck Hollow Natural Bridge Cave was an earlier instar, with a leaf case (Harp, pers. comm.). The other larvae were in the typical stone case stage. This species is one of two *Pycnopsyche* sp. collected from White Worm Spring Cave.

Pycnopsyche sp. 2, TX.

Christian County: White Worm Spring Cave. Two larvae were collected from beneath leaves in the entrance stream. Six other specimens collected from this cave were *Pycnopsyche* sp. 1.

Family Philopotamidae

Wormaldia sp., prob. *shawnee* (Ross), AC.

Phelps County: Gable Spring Cave. A larva was collected from beneath a stone in the stream in the entrance.

Wormaldia sp., AC.

Oregon County: Bat Cave. An adult was collected from loose soil and dry bat guano in total darkness, during July.

Order Plecoptera

Family Capniidae

Allocapnia sp., TX.

Camden County: Ozark Caverns. Two nymphs were collected from beneath wood in the stream, in total darkness, during March.

The northern species, *Allocapnia pygmaea* (Burmeister) is reported from spring-fed streams of the Missouri Ozarks and occurs as a glacial relict (Ross, 1965). The family Capniidae emerge from larval stages during the winter (Borror and DeLong, 1971).

Family Nemouridae

Nemoura sp., AC.

Christian County: White Worm Spring Cave. These nymphs were collected in daylight from a riffle just outside the entrance to White Worm Spring Cave, during April. The single North American genus, *Nemoura*, contains a number of species (Borror and DeLong, 1971).

Order Lepidoptera

Family Acrolophidae

Acrolophus sp., AC.

Taney County: Marholtz Cave. A larva was not found in its usual tubular web in the ground, but rather crawling free in loose soil in total darkness.

Family Noctuidae

Epizeuxis americalis (Guenée), AC.

Phelps County: Zorumski Cave. A larva was collected from beneath a stone in the dry sticks and soil of a turkey vulture (*Cathartes aura*) nest.

Scoliopteryx libatrix (Linnaeus), TX.

Franklin County: River Round Cave No. 1. **Miller County:** Ferguson Cave. **Oregon County:** Den Cave. **Phelps County:** Yancy Mills Cave No. 2. Adults were observed clinging to the ceiling in total darkness. Individuals were encountered only during November, January



Scoliopteryx libatrix is a very colorful species occurring infrequently in Missouri caves where it overwinters. Most trogloneic Lepidoptera are classified on the basis of overwintering use by adults. However, several Lepidoptera larvae were collected during other seasons.

and February. This species is infrequently encountered in caves in the Ozark Region, which it uses as overwintering sites.

The species has been reported from caves in Crawford County, Missouri (Casper, 1975; Craig, 1977) and from caves in Illinois (Peck and Lewis, 1978).

Undetermined genus and species, TX?

Miller County: Buzzards Perch Cave. A larva was collected from leaves and eastern wood rat (*Neotoma floridana*) droppings near the entrance, during May.

Family Pyralidae

Aglossa caprealis (Hubner), AC.

Phelps County: Pillman Cave and Zorumski Cave. Larvae were collected from beneath a stone in the sticks and loose soil of a turkey vulture nest in Zorumski Cave. The two larvae from Pillman Cave occurred in eastern wood rat droppings and leaves in twilight.

Galasa sp., AC.

Phelps County: Tree Root Cave. Two larvae were discovered beneath dung in the entrance, during April.

Herculia sp., AC.

Texas County: Unnamed Cave No. 1. A larva was collected from the leaves and organic debris of an eastern wood rat nest in twilight.

Undetermined genus and species, AC.

Miller County: Travertine Spring Cave. A larva was found in a shallow riffle of the cave stream in twilight. Some species of *Pyralidae* are aquatic, breathe by means of gills and feed on aquatic plants (Borror and DeLong, 1971).

Family Tineidae

Amydria sp., TX.

Camden County: Gar Cave. **Carter County:** Four Hole Cave. **Phelps County:** Zorumski Cave. **Texas County:** FS Cave 130. Larvae were collected from beneath stones in a turkey vulture nest, beneath dung and in organic debris and droppings of eastern wood rats and their nests. Larvae feed on proteinaceous debris (Peck, pers. comm.).

Nemapoginae sp., TX?

Howell County: Spring Creek Cave. **Phelps County:** Lane Cave. Larvae were collected from loose soil, leaves and sticks.

Undetermined genus and species, TX or AC?

Shannon County: Jam Up Cave. A larva was collected from bat guano in total darkness.

Family Tortricidae

Undetermined genus and species, TX.

Camden County: River Cave. Three larvae were collected from bat guano in total darkness, during April.

Order Diptera

Family Anthomyiidae

Pegomya sp., TX.

Ozark County: Goat Cave. A female was collected from loose soil and leaves in total darkness during July.

Two species, *P. affinis* Stein and *P. tarsata* (Wulp), were reported from caves in Boone County, Arkansas (Youngsteadt and Youngsteadt, 1978).

Family Cecidomyiidae

Undetermined genus and species, TX.

Carter County: Norris Cave. An adult was collected from the ceiling during January, where it was apparently overwintering.

An undetermined genus and species of this family was reported from an Illinois cave (Peck and Lewis, 1978).

Family Chironomidae

Subfamily Tanypodinae

Pentaneura sp., TX?

Laclede County: Mayfield Cave. An aquatic midge was collected from beneath a stone in the stream, near the entrance.

Two species of Chironomidae were reported from caves in Illinois and one species was reported from a Missouri cave (Peck and Lewis, 1978).

Undetermined genus and species, TX?

Carter County: Four Hole Cave. Two larvae were collected from loose soil and leaves in an eastern wood rat (*Neotoma floridana*) nest near the entrance. Although most larvae are aquatic, a few are known to occur in decaying matter and moist ground (Borror and DeLong, 1971). Craig (1977) reported undetermined materials of this family from Green Cave, Washington County, Missouri.

Subfamily Orthocladiinae

Undetermined genus and species, TX.

Phelps County: Gable Spring Cave. Four adults were collected from the ceiling near the entrance. An abundance of individuals was observed near the entrance, possibly as a result of spring emergence.

The occurrence of Chironomidae in caves has been documented previously (Craig, 1977; Peck and Lewis, 1978).

Family Dixidae

Dixa sp., TX.

Pulaski County: Wilson Cave No. 1. **Texas County:** Spring Cave No. 32. Aquatic larvae were collected from a stream in the entrance and from wood in a pool near the entrance.

McDaniel and Smith (1976) reported large numbers of *Dixa* larvae clinging to riffle substrate in the stream flowing from Needles Cave, Izard County, Arkansas.

Family Dolichopodidae

Liancalus sp., TX.

Carter County: Mosquito Cave. **Oregon County:** Bat Cave. **Taney County:** Marshall Cave. Two females were captured from the ceiling near the entrance during June and July. A male was collected from the ceiling near the entrance during July.

Undetermined genus and species, TX.

Crawford County: Bat Cave. **Phelps County:** Phelps Cave. **Texas County:** FS Cave 135. Larval specimens were collected from beneath dung, beneath a stone and from the loose soil of an eastern wood rat nest, all in total darkness. The specimens from Bat Cave and Phelps Cave were too poor for specific identifications (Thompson, pers. comm.).

Undetermined materials of this family were reported from Green Cave, Washington County, Missouri, by Craig (1977).

Family Drosophilidae

Drosophila sp., TX.

Oregon County: Bat Cave. An adult was collected from among many individuals on the ceiling and floor in twilight, during July.

Undetermined materials of this family were reported from Nameless Cave, Crawford County, Missouri (Craig, 1977).

Family Heleomyzidae

Neoeothea specus (Aldrich), TX.

Carter County: Turley Cave. **Christian County:** Moonshine Still Cave and Nine Hole Cave. **Crawford County:** Scotia Cave. **Howell County:** Jim Ridge Cave. **Ozark County:** Huffman Cave and Goat Cave. **Shannon County:** Cave Hollow Cave and Powder Mill Creek Cave. **Taney County:** Hercules Lookout Cave and Scenic Drive Cave. **Washington County:** Great Scott Cave. Specimens were collected most often from the ceiling in total darkness. Individuals were reported most numerous from caves during June through September, but are known to inhabit caves year round (Busacca, 1975).

The species is known from caves in Crawford and Washington counties, Missouri (Craig, 1977), and ranges over much of the U.S. where it is common in caves (Gill, 1962). The species is known from caves in Arkansas (Barnett, 1970; Youngsteadt and Youngsteadt, 1978) and Illinois (Peck and Lewis, 1978).

Amoebaleria defessa (Osten Sacken), TX.

Barry County: Moonshine Hole Cave. **Carter County:** Norris Cave, Mitchell Hollow Cave, Secesh Cave and Turley Cave. **Christian County:** Moonshine Still Cave. **Crawford County:** Jagged Canyon Cave. **Franklin County:** Lone Hill Onyx Cave and Mine Cave. **Oregon County:** Mine Hollow Cave. **Ozark County:** Bear Cave and Onyx Cave. **Phelps County:** Hanley Cave and Lane Cave. **Ripley County:** Panther Cave. **Shannon County:** Brawley Cave and Cave Hollow Cave. **Taney County:** Hercules Lookout Cave and Zoo Cave. **Texas County:** Unnamed Cave No. 11. **Washington County:** Great Scott Cave. Specimens were collected almost entirely from the ceiling, throughout all zones in the caves. Some specimens were collected from fungal growths, wood and from a mud bank. This species was observed year round, with higher numbers encountered during fall and winter, as expected (Busacca, 1975). The species was reported in higher concentrations in caves and occurred deeper in those caves than other species of Heleomyzidae (Busacca, 1975).

This species is known from most of the northern sections of the eastern U.S. where it is common in caves (Gill, 1962). Lewis (1974) reported the species as almost always found on the walls in Mystery Cave, Perry County, Missouri. The species was reported from several caves in Crawford County and two caves in Washington County, Missouri, by Craig (1977). Other records are from caves in Illinois (Peck and Lewis, 1978), Arkansas (Youngsteadt and Youngsteadt, 1978) and Indiana (Busacca, 1975).

Heleomyza brachypterna (Loew), TX.

Oregon County: Willow Tree Cave. A specimen was collected from the ceiling, during November. Many individuals were observed throughout the cave where they could possibly have been preparing for hibernation.

This species was reported from seven caves in Illinois (Peck and Lewis, 1978), where it was even discovered in the gut of salamanders (*Eurycea lucifuga* and *Plethodon glutinosus*). This species is known from much of North America (Gill, 1962).

Heleomyza sp., prob. *brachypterna* (Loew), TX.

Camden County: Moles Cave. An adult was collected from the ceiling in total darkness. This specimen was too poor for specific determination (Foote, pers. comm.).

Heleomyza sp., TX.

Franklin County: Indian Cave No. 2. A specimen was collected from the ceiling in total darkness, during January.

Family Muscidae

Fannia sp. 1, near *canicularis* Linnaeus, TX.

Miller County: McDowell Cave. Two of four larvae were collected from bat guano in total darkness. Two other larvae collected from the same guano were a distinctly different species of *Fannia* (Gagne', pers. comm.). Maggots of this species feed on dung and other decaying organic debris. Larvae are not generally associated with adults, creating difficulty in making specific determinations (Gagne', pers. comm.).

Peck and Lewis (1978) reported *Fannia* sp. as an accidental in one Illinois Cave.

Fannia sp. 2, near *canicularis* Linnaeus, TX.

Miller County: McDowell Cave. **Pulaski County:** Peninsula Cave. **Shannon County:** Medlock Cave. Maggots were collected from bat guano in twilight and total darkness, and from leaf debris in the entrance. Two larvae from McDowell Cave were distinctly different from two other *Fannia* larvae collected from the same spot (Gagne', pers. comm.).

Fannia sp. was reported from an Illinois cave as an accidental (Peck and Lewis, 1978).

Helina sp., AC.

St. Louis County: Overhang Cave. A female was collected from the ceiling near the entrance, during July.

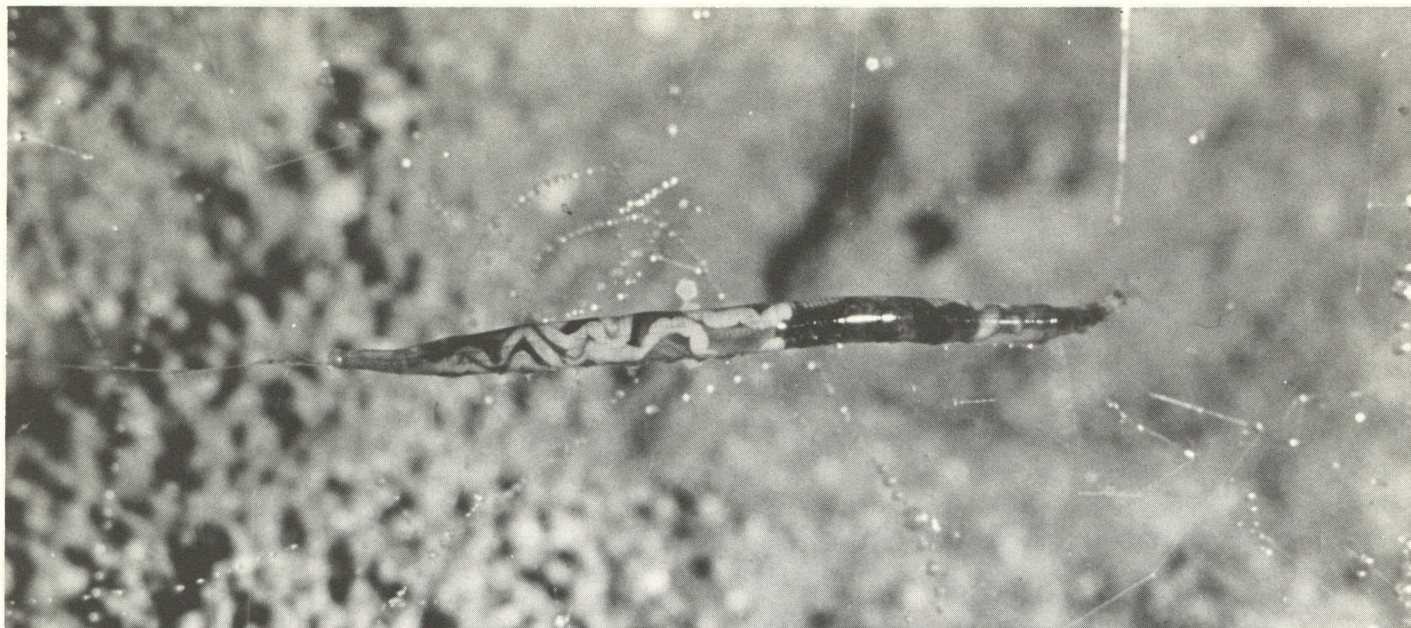
Family Mycetophilidae

Macrocera nobilis Johnson, TP.

Barry County: Currey Cave, Horse Collar Cave, Mushroom Rock Cave, Onyx Cave, Panther Cave, Patton Cave, Sweet Potato Cave and Twin Cave. **Boone County:** Hog Graveyard Cave and Polly's Pot Cave. **Camden County:** Gar Cave, Moles Cave, Pin Oak Cave and Sassafras Cave. **Carter County:** Johnny Holt Cave. **Christian County:** Infant Maze Cave, Moonshine Still Cave, Pegleg Cricket Cave and Pole Cave. **Crawford County:** Bat Cave, Campsite Cave, Refuge Cave No. 2 and Tube Cave. **Franklin County:** Copper Hollow Sinkhole Cave, Indian Cave No. 2, Wet Hollow Cave and Wildcat Cave. **Howell County:** Jim

Ridge Cave and Willow Branch Cave. **Iron County:** Boulder Cave and Cave Hollow Cave Annex. **Lincoln County:** Creech Cave and Sherwood Forest Cave. **Oregon County:** Corbet Cave, Surprise Sinkhole Cave and Whites Creek Cave. **Ozark County:** Bear Mountain Cave, Morrison Knobs Cave and Potato Cave. **Pettis County:** Dining Room Cave. **Phelps County:** Coon Cave No. 1, Coon Cave No. 3 and Little Piney Cave. **Pulaski County:** Peninsula Cave. **Taney County:** Heuszel Cave and Zoo Cave. **Texas County:** Paddy Cave and Unnamed Cave No. 2. **Washington County:** Rattlesnake Pit Cave. This species was observed in larval and pupal stages, most often in webs constructed along the edge of walls, or in cracks in walls and mud. Larvae were observed year round, with three pupae observed during May and one during July. Pupal stages last only about two weeks, while the larval stages are between nine and 10 months duration (Peck and Russell, 1976). Populations of this species ranged from scattered individuals in some caves to many hundreds of larvae concentrated in Moles Cave, Camden County. In Morrison Knobs Cave, larvae, pupae and breeding adults were recorded during May. Larvae were observed feeding on mosquitos (Diptera: Culicidae), and were among the largest specimens of this species ever observed by the author. Flying insects are a known dietary preference of this species (Peck and Russell, 1976), although *Ptomaphagus cavernicola* (Coleoptera: Leiodidae) were prey items in Mary Lawson Cave, Laclede County, Missouri.

Aley (1972) reported adults and larvae from Tumbling Creek Cave, Taney County, Missouri. The genus is worldwide in distribution, with *M. nobilis* distributed from Alberta and Ontario, Canada, and Maine, south to the southeastern U.S. (Vockeroth, 1976). Peck and Russell (1976) discussed the life history of the species and said that it was abundant in the Ozarks of Oklahoma, Arkansas and Missouri. The species is further known from caves in Kentucky, Tennessee and West Virginia (Peck and Russell, 1976).



James E. Gardner

Ranging from scattered individuals in some caves to many hundreds of larvae in other caves, *Macrochera nobilis* is abundant in the Ozarks of Oklahoma, Arkansas and Missouri. The shiny droplets are sticky secretions on the web, deposited by the larvae to attract prey.

Family Phoridae

Aneurina olympiae (Aldrich), AC.

Taney County: Zoo Cave. Two adults were collected from the surface of a rimstone pool and from the floor next to the pool.

Megaselia cavernicola (Brues), TP.

Carter County: Norris Cave. **Franklin County:** Indian Cave No. 2 and Wet Hollow Cave. **Ozark County:** Bear Cave. **Taney County:** Zoo Cave. Specimens were captured from the ceiling, from a fungal growth covering dung, and from beneath a stone in leaf litter.

This species has been previously reported from caves in Jefferson and Perry counties, Missouri (Hubricht, 1950; Lewis, 1974). The species is widespread in caves and epigean localities in the eastern U.S. (Borgmeier, 1965), including Arkansas (McDaniel and Smith, 1976; Youngsteadt and Youngsteadt, 1978) and Illinois (Peck and Lewis, 1978).

Family Psychodidae

Pericoma sp., TX.

Texas County: Spring Cave No. 32. A larva was collected from the stream at the entrance. Members of this family are sometimes extremely abundant in drains or sewers (Borror and DeLong, 1971).

Psychoda sp., TX.

Barry County: Chimney Rock Cave. **Carter County:** Mitchell Hollow Cave. Two females were collected, one from the ceiling near the entrance and the other from a fungal growth in total darkness.

Undetermined genus and species, TX.

Howell County: Jim Ridge Cave. **Phelps County:** Gable Spring Cave. One female was collected from the ceiling near the entrance during April, and another from the surface of a small isolated pool in total darkness during July.

Undetermined Psychodidae have been reported from caves in four Illinois counties (Peck and Lewis, 1978).

Family Sciaridae

Bradysia sp., near *globosa* (Petty), TP.

Taney County: Zoo Cave. A male was collected from the ceiling in total darkness, during May.

Unidentified materials reported from Missouri caves included Sciaridae (Craig, 1977). Peck and Lewis (1978) reported *Bradysia* sp. from one cave in Illinois. McDaniel and Smith (1976) reported records for two caves in Arkansas, while Youngsteadt and Youngsteadt (1978) reported the species from caves in three additional Arkansas counties.

Bradysia sp., TP.

Christian County: Infant Maze Cave. **Oregon County:** Whites Creek Cave and Willow Tree Cave. **Ozark County:** Bear Mountain Cave. **St. Louis County:** Moss Pit Cave and Rockwoods Cave. Specimens were captured on fungal growths and on the wall, in total darkness. Other specimens were collected from the ceiling in the entrance, and from beneath wood in the middle of eastern wood rat droppings.

Craig (1977) reported unidentified Sciaridae materials from caves in Crawford, Washington and Franklin counties, Missouri. *Bradysia* sp. is reported from one Illinois cave (Peck and Lewis, 1978), and from caves in Arkansas (McDaniel and Smith, 1976; Youngsteadt and Youngsteadt, 1978).

Family Sphaeroceridae

Crumomyia sp., AC.

Shannon County: Brawley Cave. A female was collected from beneath a stone on the floor in twilight. Species of this genus are rarely collected and are not known from caves (Marshall, pers. comm.).

Spelobia clunipes, TX.

Ozark County: Huffman Cave. A female was collected from beneath a flat stone near water, in twilight. This species was originally identified as *Leptocera* sp., but generic revision has placed it in the present nomenclature. This species is cosmopolitan and polysaprophagous (Marshall, pers. comm.).

Spelobia tenebrarum (Aldrich), TP.

Barry County: Moonshine Hole Cave. **Carter County:** Mitchell Hollow Cave. **Franklin County:** Indian Cave No. 2, Lone Hill Onyx Cave and Mine Cave. **Howell County:** Jim Ridge Cave. **Oregon County:** Corbet Cave, Whites Creek Cave and Willow Tree Cave. **St. Louis County:** Moss Pit Cave. Adults were found on fungal growths, on the ceiling, on dung, in leaf litter, beneath wood and on a pickerel frog (*Rana palustris*) carcass, found in all cave zones. This species was originally called *Leptocera tenebrarum* Aldrich, but was taxonomically revised to its present usage (Marshall, pers. comm.).

The species is known from Jefferson, Taney, Perry, Ste. Genevieve and Laclede counties, Missouri (Hubricht, 1950; Marshall, pers. comm.). The species was reported from Arkansas by Youngsteadt and Youngsteadt (1978). A revision of the cavernicolous North American Sphaeroceridae includes records of this species from caves in many eastern states in the U.S. (Marshall, pers. comm.).

Family Stratiomyidae

Euparyphus sp., AC.

Washington County: Pipe Spring Cave. A larva was collected from beneath a stone in the stream in the entrance.

Family Tipulidae

Pedicia sp., TX.

Taney County: Hercules Lookout Cave. **Texas County:** John's Dilemma Cave and

Unnamed Cave No. 15. **Washington County:** Pipe Spring Cave. Larvae were collected from beneath stones and leaves in cave streams near the entrance, during April and June.

Tipula sp., AC.

Warren County: tributary to Dry Fork Creek. A larva was collected beneath a stone in a surface tributary to Dry Fork Creek. McDaniel and Smith (1976) reported *Tipula algonquin* Alexander from an Arkansas cave.

Undetermined genus and species, TX.

Barry County: Piney Creek Cave. **Howell County:** Willow Branch Cave. **Texas County:** Unnamed Cave No. 2. Larvae were collected from beneath wet rotting wood and leaves in twilight.

Unidentified material of Tipulidae have been reported from Crawford and Franklin counties, Missouri (Craig, 1977), and from an Illinois cave (Peck and Lewis, 1978).

Family Trichoceridae

Undetermined genus and species, TX.

Lincoln County: Creech Cave. A larva was collected from dung on a wall shelf in total darkness.

Two species of Trichoceridae, *Trichocera regelationis* (Linnaeus) and *Trichocera* sp., are reported from caves in Illinois (Peck and Lewis, 1978).

Order Siphonaptera

Family Ceratophyllidae

Orchopeas leucopus Baker, AC.

Phelps County: Phelps Cave. A female was collected from beneath a rock in total darkness during January. Phelps Cave was an active animal den where two species of *Ixodes* (Arachnida: Acarina) were collected also.

One new species of *Orchopeas* was known from eastern wood rats (*Neotoma floridana*) in Missouri, and another from other *Neotoma* in neighboring states (Traub, pers. comm.). *O. leucopus* is a major ectoparasitic species of *Peromyscus* in many parts of the United States, Canada and Mexico (Traub, pers. comm.).

Family Hystrichopsyllidae

Ctenophthalmus pseudagyrtus Baker, AC.

Camden County: Pin Oak Cave. **Phelps County:** Lane Cave. **Taney County:** Marholtz Cave. A male was collected from the surface of a calm pool in total darkness. Two males were collected from leaf litter and loose soil in total darkness.

This species is an ectoparasite of small rodents and insectivores, *Microtus* probably being its main host (Traub, pers. comm.).

Family Pulicidae

Pulex sp., AC.

Barry County: Cave of the Winds. A female was collected from beneath dung in twilight.

Descriptions of two species of *Pulex* known from the U.S. are based on male specimens (Traub, pers. comm.). One species usually infests carnivores like skunks and coyotes, but can be abundant on deer, while another may occur on wild animals, or man (Traub, pers. comm.).

Order Hymenoptera

Family Eucoilidae

Kleidotoma sp., AC.

Dent County: Bounds Branch Cave. Five specimens were collected from beneath dung in twilight, during June.

Family Formicidae

Camponotus americanus Mayr, AC.

Wright County: Bill Dyer Lead Mine Cave. A worker was collected from leaf litter below the shallow pit entrance.

McDaniel and Smith (1976) reported *C. sayi* Emery from an Arkansas cave.

Ponera pennsylvanica Buckley, AC.

Wright County: Bill Dyer Lead Mine Cave. A worker was collected from leaf litter below the shallow pit entrance.

Family Ichneumonidae

Undetermined genus and species, AC.

Christian County: Moonshine Still Cave.

Dent County: Gray Branch Cave. **Oregon**

County: Mine Hollow Cave. **Phelps Coun-**

ty: Yancy Mills Cave No. 2. **Shannon Coun-**

ty: Blair Creek Cave. Adults were collected from the ceiling, wall and leaves near the entrance.

Family Mutillidae

Pseudomethoca sp., AC.

Wright County: Bill Dyer Lead Mine Cave.

An adult was collected from leaf litter at the bottom of the shallow pit entrance.

Acknowledgments

The data represented in this study are the results of cooperation, assistance and support given by a great number of scientists, land managers, and state and federal agencies. The Mark Twain National Forest, North Central Forest Experiment Station-Columbia, Missouri, Missouri Department of Natural Resources, Ozark National Scenic Riverways, and the Missouri Department of Conservation provided cooperative funding for this study.

This study was carried out under the supervision of John Wylie, James H. Wilson and Tom Johnson. I wish to thank Bill Kickbush, Keith Evans, Paul Nelson, Greg Iffrig, Dave Foster and Jerry Vineyard for their direct support and cooperation.

I am first and foremost grateful to those persons who actually participated in fieldwork as part of the team. They were Scott House, Charles Coatney and John Taft. My warmest acknowledgment is extended to Treva Imes for her many years of involvement with the study. I could not possibly list every person who aided this study directly, or indirectly, but my deepest appreciation is extended to them.

I am truly grateful to Elizabeth A. Cook for developing and implementing computer programs for cave data. Her enthusiasm, skills and perseverance resulted in a solution to storing and manipulating a myriad of cave data.

I wish to extend my appreciation and respect to the Missouri Speleological Survey, Inc., for the loan of their cave information, freely given in the spirit of cooperation. Certain members of the MSS unselfishly provided assistance in collecting data. A special note of appreciation goes to Scott House, MSS liaison, for coordinating the efforts of volunteers utilized during this study.

I am grateful to Gordon Maupin and James H. Wilson for providing instruction and support when entering deep vertical caves was necessary. Richard Clawson also assisted in vertical work.

I am truly thankful to the following reviewers of selected taxons, for their comments and constructive criticisms: Kenneth Christiansen, Lynn Ferguson, Clarence and Marie Goodnight, George Harp, Horton Hobbs, Jr., John Holsinger, Theodore Hubbell, Leslie Hubricht, Jerry Lewis, Bill Muchmore, Stewart Peck, William Peck, Rowland Shelley, Gerald Summers and Robert Traub.

I gratefully acknowledge reviews by the following research dipterists on staff at the Systematic Entomology Laboratory, Insect Identification and Beneficial Insect Introduction Institute, USDA, Beltsville, Maryland: F.C. Foote, R. J. Gagne', C. W. Sabrowsky, G. Steyskal, F. C. Thompson and W. W. Wirth.

I am especially thankful to James H. Wilson, James H. Auckley, David T. Catlin and Stewart B. Peck for reviewing the lengthy preliminary manuscript. Jerry Vineyard most kindly reviewed the front sections of the first draft and provided helpful suggestions. James Auckley reviewed the manuscript in its entirety and made many helpful comments.

I wish to express my warmest appreciation to Everett Chaney, Glen Gambill and the late Paul Curry. Without their concern and help, and sharing of dozens of new cave locations, the results would not have been as meaningful.

Exact and meaningful base line data could not have been compiled without the cooperation of 60 invertebrate taxonomists, who generously provided determinations and often supplied data from their personal records.

The following are Research Entomologists of the Systematic Entomology Laboratory, Insect Identification and Beneficial Insect Introduction Institute (IIBIII), USDA, Beltsville, Maryland:

Anderson, Dr. D. M.

Coleoptera: Cantharidae, Carabidae, Lampyridae, Leiodidae, Melandryidae, Phengodidae, Ptilodactylidae, Staphylinidae

Foote, Dr. R. H.

Diptera: Heleomyzidae

Gagne', Dr. R. J.

Diptera: Cecidomyiidae, Muscidae, Mycetophilidae, Sciaridae

Gordon, Dr. R. D.

Coleoptera: Scarabaeidae, Cantharidae, Lucanidae

Kingsolver, Dr. J. M.

Coleoptera: Cryptophagidae, Histeridae, Leiodidae, Leptinidae

Knutson, Dr. Lloyd, Chairman, IIBIII

Coordinator and liaison between this study and his institution.

Kramer, Dr. J. P.

Homoptera: Cixiidae

Menke, Dr. A. S.

Hymenoptera: Eucilidae, Mutillidae

Sabrosky, Dr. C. W.

Diptera: Sphaeroceridae

Smith, Dr. D. R.

Hymenoptera: Formicidae

Spilman, Dr. T. J.

Coleoptera: Alleculidae, Elateridae, Lampyridae, Tenebrionidae, Silphidae

Steyskal, Dr. G.

Diptera: Heleomyzidae, Sphaeroceridae

Thompson, Dr. F. C.

Diptera: Anthomyiidae, Dolichopodidae, Drosophilidae, Psychodidae

Weisman, Dr. D. M.

Lepidoptera: Acrolophidae, Tineidae, Noctuidae, Pyralidae, Tortricidae

White, Dr. R.

Coleoptera: Chrysomelidae

Whitehead, Dr. R. D.

Coleoptera: Curculionidae

Wirth, Dr. W. W.

Diptera: Chironomidae, Phoridae, Drosophilidae, Sphaeroceridae

Cooperating scientists of the Smithsonian Institute (via Systematic Entomology Laboratory, IIBIII), Washington, D.C., are as follows:

Erwin, Dr. T. L.
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Flint, Dr. O. S.
Trichoptera: Philopotamidae
Neuroptera: Corydalidae
Froeschner, Dr. R. C.
Hemiptera: Pentatomidae, Reduviidae, Ceratocombidae, Gerridae
Hobbs, Dr. H. H., Jr.
Crustacea: Cambaridae
Kenk, Dr. R.
Turbellaria: Planariidae
Mathis, Dr. W. N.
Diptera: Tipulidae, Trichoceridae
Spangler, Dr. P. J.
Coleoptera: Dytiscidae
Traub, Dr. R.
Siphonaptera: Ceratophyllidae, Dolichopsyllidae, Hystrihopsyllidae, Pulicidae.

Additional cooperating scientists were:

Becker, Dr. E. C.
Coleoptera: Elateridae
Buchanon, Dr. A.
Mollusca
Campbell, Dr. M.
Coleoptera: Staphyllinidae
Christiansen, Dr. K.
Collembola
Connell, Dr. W. A.
Coleoptera: Nitidulidae
Craig, Mr. J. L. and Mrs. Cathleen
Chilopoda
Ferguson, Dr. L. M.
Diplura
Figg, Mr. D.
Various invertebrate orders
Franz, Dr. R.
Decapoda: Cambaridae
Gass, Mr. R.
Collembola
Gertsch, Dr. W.
Arachnida: Lycosidae
Goodnight, Dr. C. J. and Mrs. Marie
Arachnida: Opilionidae
Harp, Dr. G. L.
Gordiodae: Gordiidae. Hirudenea: Glossiphoniidae.
Coleoptera: Dytiscidae. Ephemeroptera: Leptophlebiidae. Megaloptera: Corydalidae. Hemiptera: Gerriidae, Veliidae. Trichoptera: Hydropsychidae. Plecoptera: Nemouridae. Diptera: Chironomidae, Dixidae, Psychodidae, Tipulidae

Holsinger, Dr. J. R.
Crustacea: Amphipoda
Hubbell, Dr. T. H.
Orthoptera: Rhabdophoridae
Hubricht, Mr. L.
Gastropoda
Keirans, Dr. J. E.
Acarina: Acari
Klimasewski, Dr. J.
Coleoptera: Staphyllinidae
Lewis, Dr. J. J.
Crustacea: Isopoda
Lindquist, Dr. E. E.
Acarina: Acari
Marshall, Dr. S. A.
Diptera: Sphaeroceridae
Muchmore, Dr. W. B.
Arachnida: Pseudoscorpionidae; Crustacea: Isopoda
Page, Dr. L. M.
Crustacea: Cambaridae
Peck, Dr. S. B.
Coleoptera: Leiodidae, Staphyllinidae
Peck, Dr. W. B.
Arachnida: Araneae
Remington, Dr. C. L.
Thysanura
Shear, Dr. W. A.
Diplopoda: Chordeumida
Shelley, Dr. R. M.
Diplopoda: Callipodida
Smith, Dr. I. M.
Acarina: Acari
Smetona, Dr. A.
Coleoptera: Staphyllinidae
Summers, Dr. G.
Chilopoda
Thompson, Dr. F.
Gastropoda: Hydrobiidae
Trial, Ms. L.
Crustacea: Cambaridae
Welbourn, Dr. C.
Acarina: Acari
Withrow, Mr. C. P.
Diplopoda

I am truly grateful to Freida Fisher and Barbara Singleton for their experience and fortitude in typing and correcting the final manuscript. John Taft also assisted in the preparation of the preliminary manuscript.

I am deeply appreciative of Donna Pasley for her professional artistic talents and experiences used in the design and layout of this publication. Many thanks also to Mitzi Crump for her painstaking efforts in producing a final copy of this publication.

Tom Johnson and Dawn Drainer graciously provided their professional talents in developing the fine photographic illustrations used throughout this publication.

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